INSTALLATION MANUAL

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SEE THE FOLLOWING PAGES FOR A COMPLETE TABLE OF CONTENTS.

NOTES, CAUTIONS AND WARNINGS

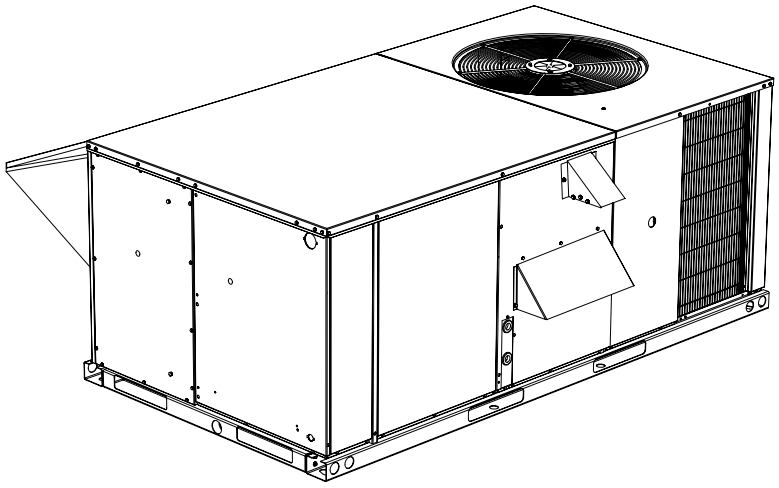
The installer should pay particular attention to the words: *NOTE*, *CAUTION*, and *WARNING*. Notes are intended to clarify or make the installation easier. Cautions are given to prevent equipment damage. Warnings are given to alert installer that personal injury and/or equipment damage may result if installation procedure is not handled properly.

CAUTION: READ ALL SAFETY GUIDES BEFORE YOU BEGIN TO INSTALL YOUR UNIT.

SAVE THIS MANUAL

SUNLINE™ GAS/ELECTRIC SINGLE PACKAGE AIR CONDITIONERS

D(CE, CG) 036, 048, 060 & 072
D(HE, HG) 036, 048 & 060



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GENERAL

YORK Model D(CE, CG) and D(HE, HG) units are either single package cooling units or single package gas-fired central heating furnaces with cooling unit. Both are designed for outdoor installation on a rooftop or slab.

The units are completely assembled on rigid, permanently attached base rails. All piping, refrigerant charge, and electrical wiring is factory installed and tested. The units require electric power, gas connection, duct connections, installation of combustion air inlet hood, flue gas outlet hoods and fixed outdoor air intake damper (units without economizer or motorized damper option only) at the point of installation.

The supplemental field installed electric heaters have nickel-chrome elements and utilize single point power connection.

The gas-fired heaters have aluminized-steel tubular heat exchangers. The units have spark ignition with proven pilot. All gas heaters are shipped from the factory equipped for natural gas use, but can be field converted to L.P./ Propane with Kit Model # 1NP0440.

SAFETY CONSIDERATIONS

Due to system pressure, moving parts and electrical components, installation and servicing of air conditioning equipment can be hazardous. Only qualified, trained, service personnel should install, repair, maintain or service this equipment.

Observe all precautions in the literature, on labels and tags accompanying the equipment whenever working on air conditioning equipment. Be sure to follow all other safety precautions that apply.

Wear safety glasses and work gloves, and follow all safety codes. Use a quenching cloth and have a fire extinguisher available for all brazing operations.

⚠WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow safety warnings exactly could result in serious injury, death, or property damage.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

- WHAT TO DO IF YOU SMELL GAS:
  - Do not try to light any appliance.
  - Do not touch any electrical switch; do not use any phone in your building.
  - Leave the building immediately.
  - Immediately call your gas supplier from a neighbor’s phone. Follow the gas supplier’s instructions.
  - If you cannot reach the gas supplier, call the fire department.

- Installation and service must be performed by a qualified installer, service agency or the gas supplier.

INSPECTION

As soon as a unit is received, it should be inspected for possible damage during transit. If damage is evident, the extent of the damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing. Refer to Form 50.15-NM for additional information.

REFERENCE

Additional information is available in the following reference forms:

- Technical Guide - D(CE, CG) 036-072, 254040-YTG-A-0506
- Technical Guide - D(HE, HG) 036-060, 255038-YTG-A-0506
- General Installation - D(CE, CG) 036-072 and D(HE, HG) 036-060, 177817-YIM-A-0506

RENEWAL PARTS

Contact your local York® parts distribution center for authorized replacement parts.

APPROVALS

Design listed by CSA as follows:

- For use as a cooling unit only with or without optional electric heat.
- For use as a forced air furnace with cooling unit
- For outdoor installation only.
- For installation on combustible material.
- For use with natural gas or propane gas.

⚠ CAUTION

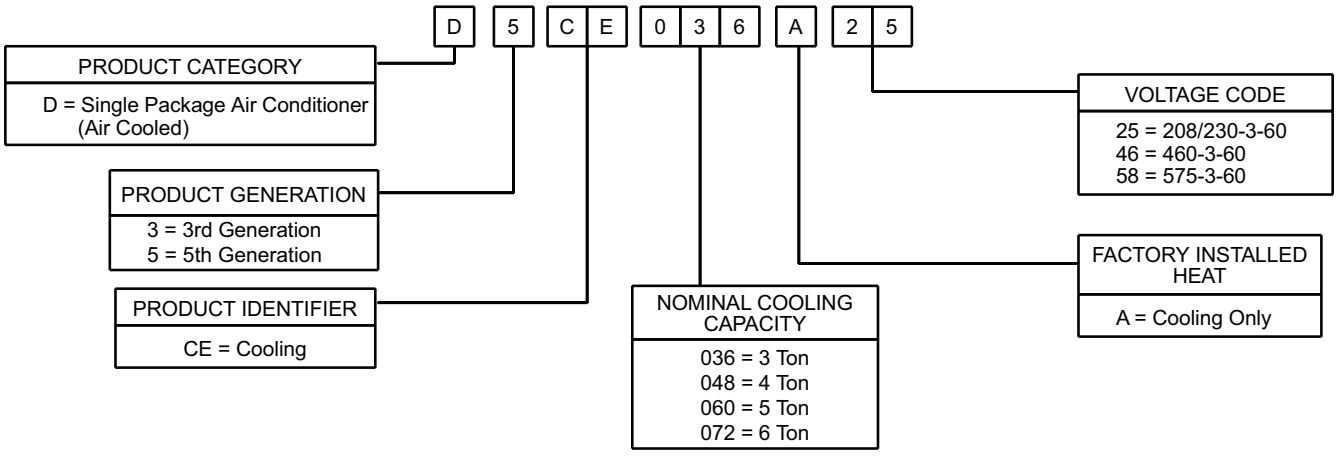
This product must be installed in strict compliance with the enclosed installation instructions and any applicable local, state, and national codes including, but not limited to, building, electrical, and mechanical codes.

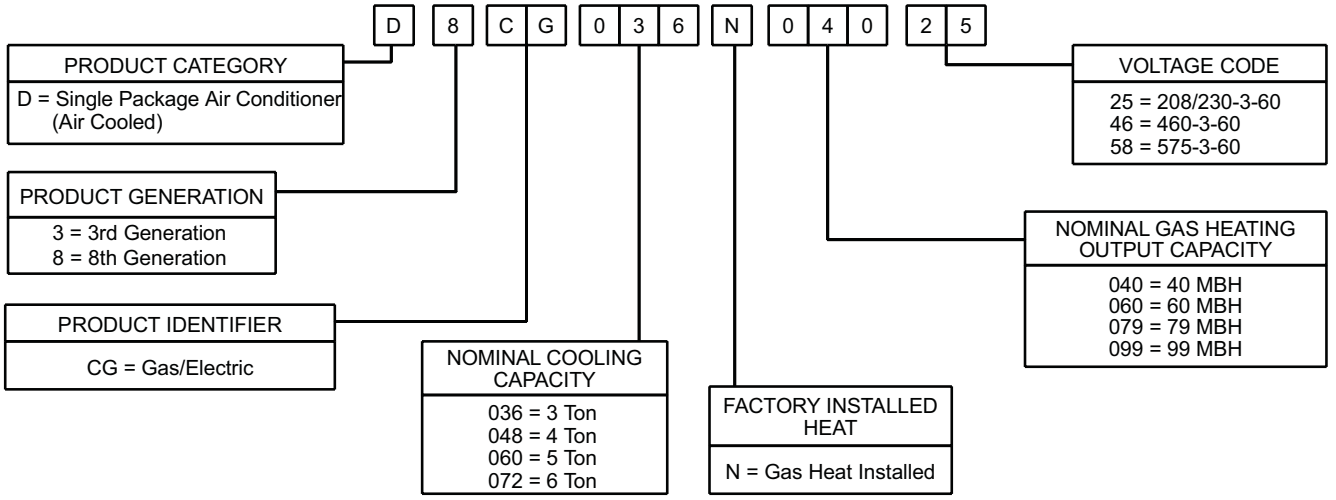
⚠ WARNING

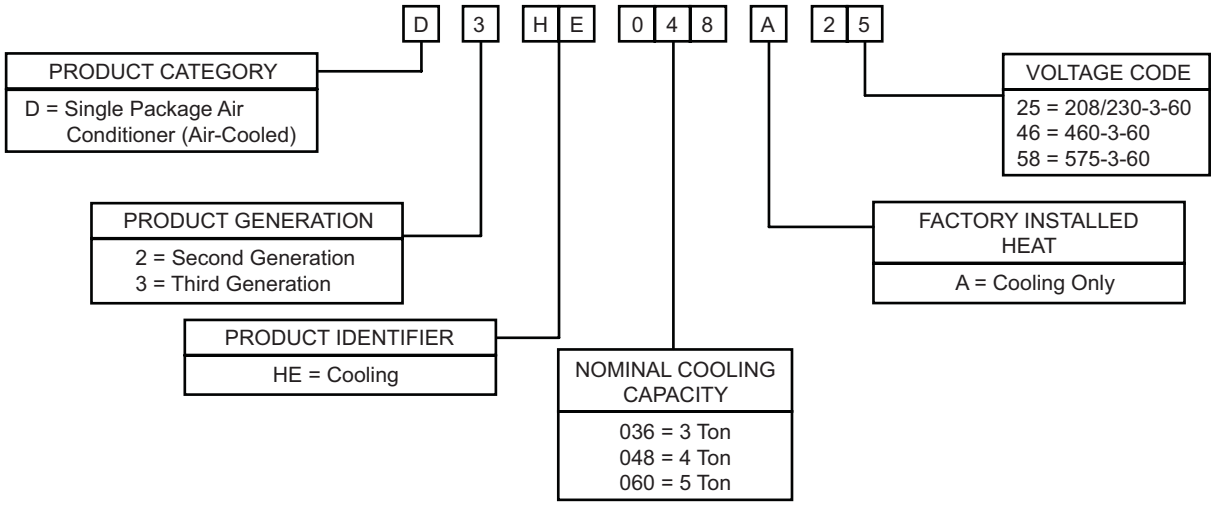
Improper installation may create a condition where the operation of the product could cause personal injury or property damage.

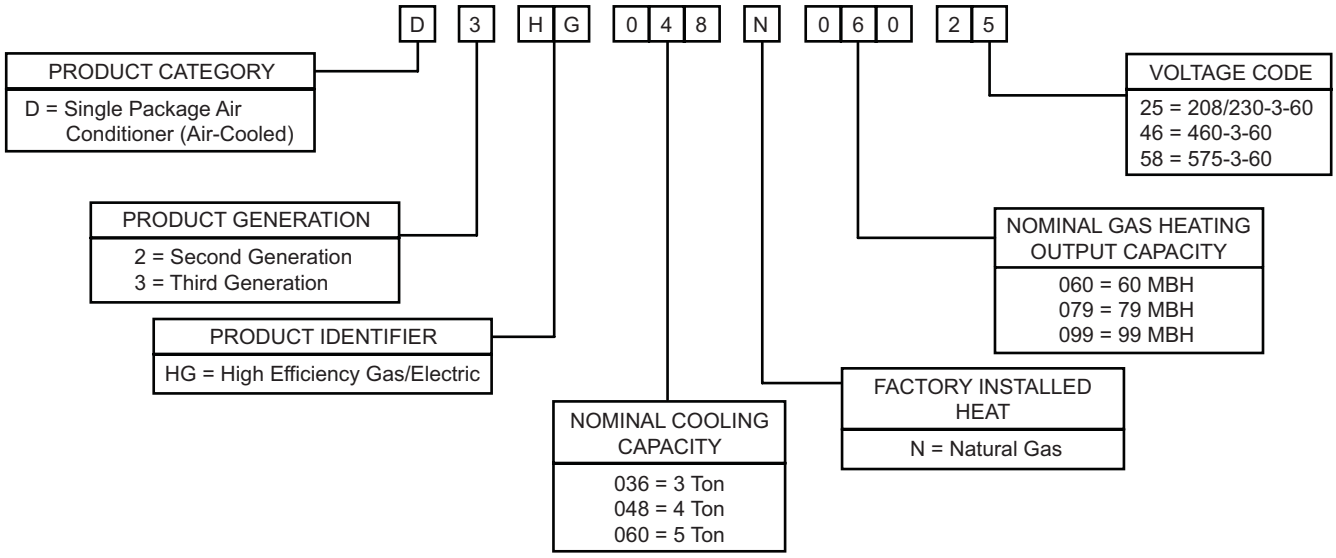
The installer should pay particular attention to the words: NOTE, CAUTION and WARNING. Notes are intended to clarify or make the installation easier. Cautions are given to prevent equipment damage. Warnings are given to alert installer that personal injury and/or equipment damage may result if installation procedure is not handled properly.

PRODUCT NOMENCLATURE




D 8 C G 0 3 6 N 0 4 0 2 5
PRODUCT CATEGORY
D = Single Package Air Conditioner (Air Cooled)
PRODUCT GENERATION
3 = 3rd Generation
8 = 8th Generation
PRODUCT IDENTIFIER
CG = Gas/Electric
NOMINAL COOLING CAPACITY
036 = 3 Ton
048 = 4 Ton
060 = 5 Ton
072 = 6 Ton
FACTORY INSTALLED HEAT
N = Gas Heat Installed
NOMINAL GAS HEATING OUTPUT CAPACITY
040 = 40 MBH
060 = 60 MBH
079 = 79 MBH
099 = 99 MBH
VOLTAGE CODE
25 = 208/230-3-60
46 = 460-3-60
58 = 575-3-60


D 3 H E 0 4 8 A 2 5
PRODUCT CATEGORY
D = Single Package Air Conditioner (Air-Cooled)
PRODUCT GENERATION
2 = Second Generation
3 = Third Generation
PRODUCT IDENTIFIER
HE = Cooling
NOMINAL COOLING CAPACITY
036 = 3 Ton
048 = 4 Ton
060 = 5 Ton
FACTORY INSTALLED HEAT
A = Cooling Only
VOLTAGE CODE
25 = 208/230-3-60
46 = 460-3-60
58 = 575-3-60


D 3 H G 0 4 8 N 0 6 0 2 5
PRODUCT CATEGORY
D = Single Package Air Conditioner (Air-Cooled)
PRODUCT GENERATION
2 = Second Generation
3 = Third Generation
PRODUCT IDENTIFIER
HG = High Efficiency Gas/Electric
NOMINAL COOLING CAPACITY
036 = 3 Ton
048 = 4 Ton
060 = 5 Ton
FACTORY INSTALLED HEAT
N = Natural Gas
NOMINAL GAS HEATING OUTPUT CAPACITY
060 = 60 MBH
079 = 79 MBH
099 = 99 MBH
VOLTAGE CODE
25 = 208/230-3-60
46 = 460-3-60
58 = 575-3-60

INSTALLATION

INSTALLATION SAFETY INFORMATION:

Read these instructions before continuing this appliance installation. This is an outdoor combination heating and cooling unit. The installer must assure that these instructions are made available to the consumer and with instructions to retain them for future reference.

1. Refer to the furnace rating plate for the approved type of gas for this furnace.
2. Install this furnace only in a location and position as specified on page 9 of these instructions.
3. Never test for gas leaks with an open flame. Use commercially available soap solution made specifically for the detection of leaks when checking all connections.
4. Always install furnace to operate within the furnace's intended temperature-rise range with the duct system and within the allowable external static pressure range, as specified on the unit name/rating plate.
5. This equipment is not to be used for temporary heating or cooling of buildings or structures under construction.

⚠WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death or property damage.

Never test for gas leaks with an open flame. use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

LIMITATIONS

These units must be installed in accordance with the following national and local safety codes:

In U.S.A.:

- National Electrical Code ANSI/NFPA No. 70.
- National Fuel Gas Code Z223.1.
- Gas-Fired Central Furnace Standard ANSI Z21.47a.
- Local gas utility requirements.

In Canada:

- Current Canadian Electrical Code C22.1.
- Current Gas Installation Codes CSA-B149.1.
- Local plumbing and waste water codes.
- Other applicable local codes.

Refer to the Unit Application Data Table 1 and to the Gas Heat Application Data Table 4.

If components are to be added to a unit to meet local codes, they are to be installed at the dealer's and/or the customer's expense.

Size of unit for proposed installation should be based on heat loss/heat gain calculation made according to the methods of the Air Conditioning Contractors of America (ACCA).

TABLE 1: UNIT APPLICATION DATA (D(CE, CG), D(HE, HG))

UNIT MODEL NUMBER		036	048	060	072
Voltage Variation, Min. / Max.[1]	208/230	187 / 252			
	460	432 / 504			
	575	540 / 630			
Supply Air CFM, Nom.		1200	1600	2000	2400
Wet Bulb Temperature (ºF) of Air on Evaporator Coil, Min. / Max		57 / 72			
Dry Bulb Temperature (ºF) of Air on Condenser Coil, Min. / Max.		0 / 120			

1. Utilization range “A” in accordance with ARI Standard 110.

LOCATION

Use the following guidelines to select a suitable location for these units.

1. Unit is designed for outdoor installation only.
2. Condenser coils must have an unlimited supply of air.
3. Where a choice of location is possible, position the unit on either north or east side of building.
4. For ground level installation, use a level concrete slab with a minimum thickness of 4 inches. The length and width should be at least 6 inches greater than the unit base rails. Do not tie slab to the building foundation.
5. Roof structures must be able to support the weight of the unit and its options and/or accessories. Unit must be installed on a solid level roof curb or appropriate angle iron frame.
6. Maintain level tolerance to 1/2 inch maximum across the entire length or width of the unit.

⚠WARNING

Excessive exposure of this furnace to contaminated combustion air may result in equipment damage or personal injury. Typical contaminates include: permanent wave solutions, chlorinated waxes and cleaners, chlorine based swimming pool chemicals, water softening chemicals, carbon tetrachloride, Halogen type refrigerants, cleaning solvents (e.g. perchloroethylene), printing inks, paint removers, varnishes, hydrochloric acid, cements and glues, antistatic fabric softeners for clothes dryers, masonry acid washing materials.

If a unit is to be installed on a roof curb or special frame other than a YORK roof curb, gasketing must be applied to all surfaces that come in contact with the unit underside.

RIGGING AND HANDLING

Exercise care when moving the unit. Do not remove any packaging until the unit is near the place of installation. Rig the unit by attaching chain or cable slings to the lifting holes provided in the base rails. Spreader bars, whose length exceeds the largest dimension across the unit, MUST BE USED.

Units may also be moved or lifted with a forklift. Slotted openings in the base rails are provided for this purpose. Fork lengths must be a minimum of 42 inches.

Remove the nesting brackets from the four corners on the top of the unit. All screws that are removed when removing the brackets must be replaced on the unit.

Refer to Tables 10 and 12 for unit weights and to the Figure 9 for approximate center of gravity.

⚠ CAUTION

Before lifting a unit, make sure that all panels are in place and that its weight is distributed equally on all cables so it will lift evenly.

CLEARANCES

All units require certain clearances for proper operation and service. Installer must make provisions for adequate combustion and ventilation air in accordance with Section 5.3, Air for Combustion and Ventilation of the National Fuel Gas Code, ANSI Z223.1 (in U.S.A.) or

Sections 7.2, 7.3 or 7.4 of Gas Installation Codes CSA-B149.1 (in Canada) and/or applicable provisions of the local building codes. Refer to Dimensions and Clearances shown in Figures 10 through 13 and Tables 18 and 19 for the clearances required for combustible construction, servicing, and proper unit operation.

⚠WARNING

Do not permit overhanging structures or shrubs to obstruct outdoor air discharge outlet, combustion air inlet or vent outlets.

DUCTWORK

Ductwork should be designed and sized according to the methods in Manual Q of the Air Conditioning Contractors of America (ACCA).

A closed return duct system shall be used. This shall not preclude use of economizers or outdoor fresh air intake. The supply and return air duct connections at the unit should be made with flexible joints to minimize noise.

The supply and return air duct systems should be designed for the CFM and static requirements of the job. They should NOT be sized to match the dimensions of the duct connections on the unit.

⚠ CAUTION

When fastening ductwork to side duct flanges on unit, insert screws through duct flanges only. DO NOT insert screws through casing. Outdoor ductwork must be insulated and waterproofed.

Refer to Figures 10 through 14 for information concerning side and bottom supply and return air duct openings.

NOTE: It is recommended that, in Canada, the outlet duct be provided with a removable access panel. It is recommended that this opening be accessible when the unit is installed in service, and of a size such that smoke or reflected light may be observed inside the casing to indicate the presence of leaks in the heat exchanger. The cover should be attached in a manner adequate to prevent leakage.

CONDENSATE DRAIN

Plumbing must conform to local codes. Use a sealing compound on male pipe threads. Install a condensate drain line from the 3/4” NPT female connection on the unit to an open drain.

NOTE: The condensate drain operates in a negative pressure in the cabinet. The condensate drain line MUST be trapped to provide proper drainage. See Figure 1.

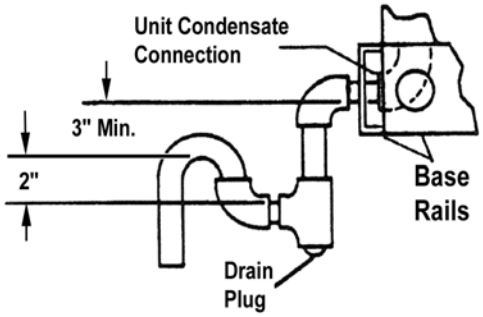


FIGURE 1 - RECOMMENDED DRAIN PIPING

COMPRESSORS

Units are shipped with compressor mountings factory-adjusted and ready for operation.

Units with scroll compressors have a shipping bracket which must be removed after the unit is set in place. See Figure 2.

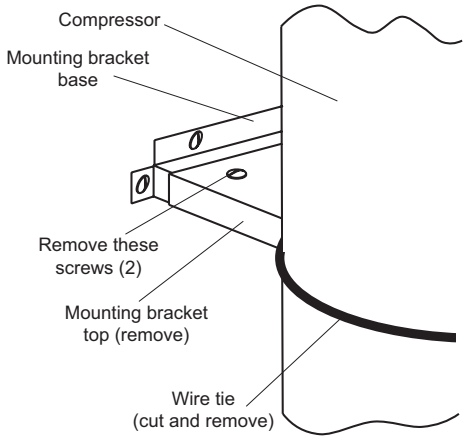


FIGURE 2 - COMPRESSOR RESTRAINING BRACKET

⚠ CAUTION

Do not loosen compressor mounting bolts.

FILTERS

One-inch or two-inch filters can be supplied with each unit. Filters must always be installed ahead of the evaporator coil and must be kept clean or replaced with same size and type. Dirty filters will reduce the capacity of the unit and will result in frosted coils or safety shutdown. Minimum filter area and required sizes are shown in Physical Data Tables 9 and 11.

SERVICE ACCESS

The following removable panels provide access to all serviceable components:

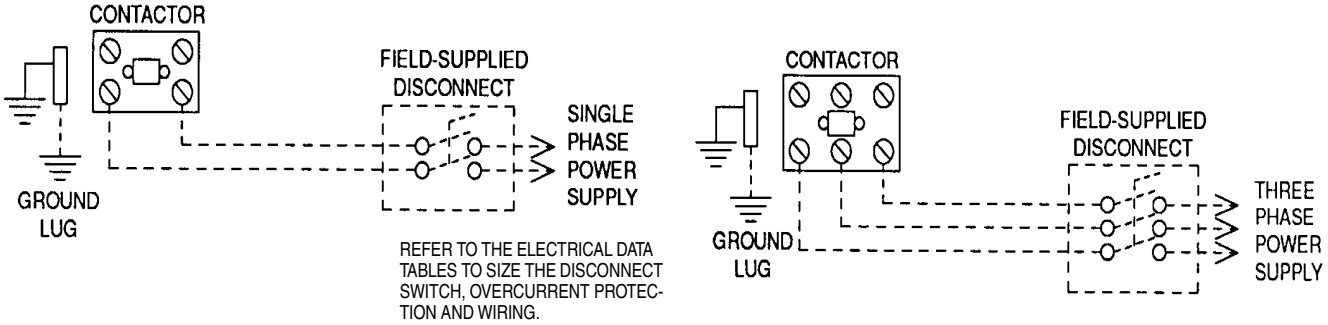
- Compressor compartment
- Electric Heat compartment
- Gas Heat compartment
- Blower compartment
- Main control box
- Filter compartment

Refer to the Dimensions and Clearances shown in Figures 10, 11, 13 and 14 for location of these access panels.

⚠ CAUTION

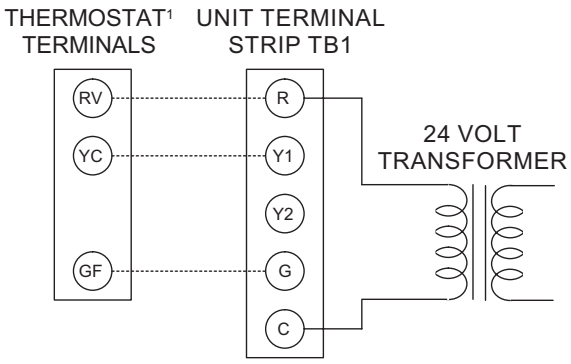
Make sure that all screws and panel latches are replaced and properly positioned on the unit to maintain an airtight seal.

TYPICAL POWER WIRING



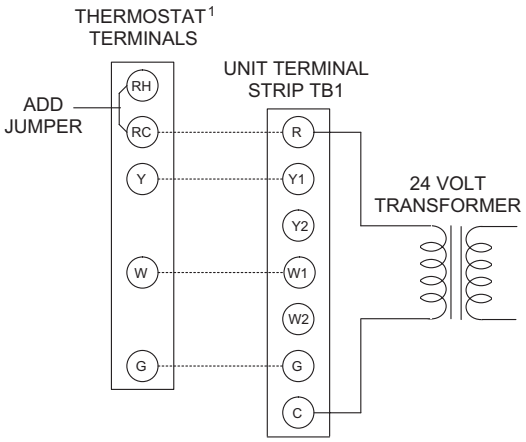
TYPICAL CONTROL WIRING

COOLING ONLY (24 VOLT THERMOSTAT)



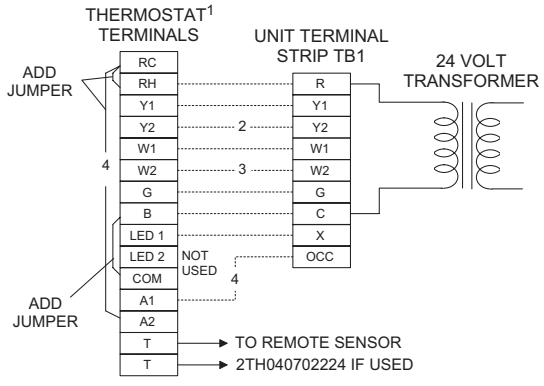
[1]24 VOLT THERMOSTAT 2TH07701024. TO CONTROL THE ECONOMIZER ON SECOND STAGE COOLING, USE THE THERMOSTAT 2TH0401224.

COOLING / HEATING (24 VOLT THERMOSTAT)



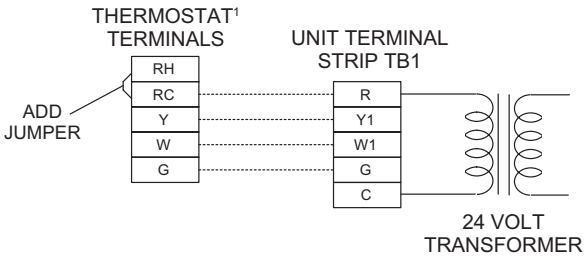
[1]24 VOLT THERMOSTAT 2ET07701024. TO CONTROL THE ECONOMIZER ON THE SECOND STAGE COOLING OR TO HAVE AN ELECTRIC HEAT ACCESSORY WITH TWO STAGES OF HEAT, USE THERMOSTAT 2TH0471024.

COOLING / HEATING (ELECTRONIC THERMOSTAT) MULTI STAGE



[1] ELECTRONIC PROGRAMMABLE THERMOSTAT 2ET04700224 (INCLUDES SUBBASE).
[2] SECOND STAGE COOLING IS NOT REQUIRED ON UNITS LESS ECONOMIZER.
[3] SECOND STAGE HEATING IS ONLY REQUIRED ON UNITS WITH A TWO STAGE ELECTRIC HEATER.
[4] REMOVE JUMPER J2 FROM TERMINALS 4 AND 9 ON JUMPER PLUG CONNECTOR P6 ON UNITS WITH ECONOMIZER. TERMINALS A1 AND A2 PROVIDE A RELAY OUT-PUT TO CLOSE THE OUTDOOR ECONOMIZER DAMPERS WHEN THE THERMOSTAT SWITCHES TO THE SET-BACK POSITION.

COOLING / HEATING (ELECTRONIC THERMOSTAT) SINGLE STAGE



[1]ELECTRONIC PROGRAMMABLE THERMOSTAT 2ET07701024 (INCLUDES SUBBASE). TO CONTROL THE ECONOMIZER ON SECOND STAGE COOLING, USE THERMOSTAT 2TH04700224.

FIGURE 3 - TYPICAL FIELD POWER & CONTROL WIRING

THERMOSTAT

The room thermostat should be located on an inside wall approximately 56 inches above the floor where it will not be subject to drafts, sun exposure or heat from electrical fixtures or appliances. Follow the manufacturer's instructions enclosed with the thermostat for general installation procedure. A minimum of seven color-coded insulated wires (#18 AWG) should be used to connect the thermostat to the unit.

POWER AND CONTROL WIRING

Field wiring to the unit must conform to provisions of the National Electrical Code, ANSI / NFPA No. 70 (in U.S.A.), current Canadian Electrical Code C22.1 (in Canada) and/or local ordinances. The unit must be electrically grounded in accordance with NEC and CEC (as specified above) and/or local codes. Voltage tolerances, which must be maintained at the compressor terminals, during starting and running conditions, are indicated on the unit Rating Plate and the Unit Application Data table.

The internal wiring harness furnished with this unit is an integral part of a CSA design certified unit. Field alteration to comply with electrical codes should not be required.

A fused disconnect switch should be field provided for the unit. The switch must be separate from all other circuits. Wire entry at knockout openings require conduit fittings to comply with NEC (in U.S.A.), CEC (in Canada) and/or local codes. If any of the wire supplied with the unit must be replaced, replacement wire must be of the type shown on the wiring diagram and the same minimum gauge as the replaced wire.

Use copper conductors properly sized to carry the load. Each unit must be wired with a separate branch circuit fed directly from the meter panel and properly fused.

⚠ CAUTION

When connecting electrical power and control wiring to the unit, waterproof type connectors **MUST BE USED** so that water or moisture cannot be drawn into the unit during normal operation. The above waterproofing conditions will also apply when installing a field-supplied disconnect switch.

Refer to the Typical Field Wiring Figure 3 and to the appropriate unit wiring diagram for control circuit and power wiring information.

TABLE 2: CONTROL WIRE SIZES

Wire Size	Maximum Length[1]
18 AWG	150 Feet

1. From the unit to the thermostat and back to the unit.

OPTIONS/ACCESSORIES

ELECTRIC HEAT

The field-installed heaters are wired for single point power supply. Power supply need only be brought into the single point terminal block and thermostat wiring to the low voltage terminal strip located in the upper portion of the unit control box.

These CSA approved heaters are located within the central compartment of the unit with the heater elements extending into the supply air chamber. Refer to Figure 10 for access panel location.

Fuses are supplied, where required, by the factory. Some KW sizes require fuses and others do not. Refer to Table 3 for minimum CFM limitations and to Tables 13 through 17 for electrical data.

TABLE 3: ELECTRIC HEATER CFM LIMITATIONS

UNITMODEL SIZE NOMINAL TONS	VOLTAGE	MINIMUM SUPPLY AIR CFM					
		HEATER SIZE NOMINAL KW					
		5	7	10	15	20	30
3	208/230-3-60	1100	1100	1200	1200	1300	-
	460-3-60	-	1100	1200	1200	1300	-
	575-3-60	-	-	1200	1200	1300	-
4	208/230-3-60	1300	1300	1300	1300	1300	-
	460-3-60	-	1300	1300	1300	1300	-
	575-3-60	-	-	1300	1300	1400	-
5	208/230-3-60	1600	1600	1600	1600	1600	1600
	460-3-60	-	1600	1600	1600	1600	1600
	575-3-60	-	-	1600	1600	1600	1800
6	208/230-3-60	1800	1800	1800	1800	1800	1800
	460-3-60	-	1800	1800	1800	1800	1800
	575-3-60	-	-	1800	1800	1800	1800

GAS HEAT

These gas-fired heaters have aluminized-steel tubular heat exchangers with spark ignition with proven pilot.

All gas heaters are shipped from the factory equipped for natural gas use. See Gas Heat Application Data Table.

For natural gas heating installations in locations requiring low NOx emissions, Accessory model 1LN0406 must be used.

TABLE 4: GAS HEAT APPLICATION DATA

GAS HEAT OPTION	INPUT CAPACITY (MBH)	OUTPUT CAPACITY (MBH)	AVAILABLE ON MODELS	GAS RATE[1] (FT^3/HR)	TEMPERATURE RISE °F AT FULL INPUT[2]	
					MIN.	MAX.
N040	50	40	3 TON	47	15	45
N060	75	60	4 TON	70	45	55
N079	100	80	3/5/6 TON	93	40/25/25	70/55/55
N099	125	100	4/5/6 TON	116	45/35/35	75/65/65

NOTE: Gas Heaters are shipped available for natural gas, but can be converted to L.P. with Kit Model No. 1NP0440. All furnaces meet the latest California seasonal efficiency requirements.

1. Based on 1075 Btu/Ft^3.
2. The air flow must be adjusted to obtain a temperature rise within the range shown.

GAS PIPING

Proper sizing of gas piping depends on the cubic feet per hour of gas flow required, specific gravity of the gas and the length of run. “National Fuel Gas Code” Z223.1 (in U.S.A.) or the current Gas Installation Codes CSA-B149.1 (in Canada) should be followed in all cases unless superseded by local codes or gas utility requirements. Refer to the Pipe Sizing Table 5.

The heating value of the gas may differ with locality. The value should be checked with the local gas utility.

NOTE: There may be a local gas utility requirement specifying a minimum diameter for gas piping. All units require a 1/2” pipe connection at the entrance fitting.

TABLE 5: GAS PIPE SIZING

LENGTH IN FEET	NOMINAL IRON PIPE SIZE			
	1/2 in.	3/4 in.	1 in.	1-1/4 in.
10	132	278	520	1,050
20	92	190	350	730
30	73	152	285	590
40	63	130	245	500
50	56	115	215	440
60	50	105	195	400
70	46	96	180	370
80	43	90	170	350
90	40	84	160	320
100	38	79	150	305

Maximum capacity of pipe in cubic feet of gas per hour. (Based upon a pressure drop of 0.3 inch water column and 0.6 specific gravity gas).

GAS CONNECTION

The gas supply line can be routed through the knockouts located on the front of the unit or through the opening provided in the unit's base. Refer to Figure 11 to locate these access openings. Typical supply piping arrangements are shown in Figures 4 and 5. All shaded items are field-supplied.

If gas supply line is routed through the unit's base ensure that the burner assembly can be removed for maintenance without disturbing the supply line. The supply piping and fittings must lie below the bottom gas manifold to avoid interference with the burner assembly.

Two grommets are shipped in the blower compartment (in parts bag taped to the blower housing) of every unit with gas heat and should be used in the knockouts when the gas piping penetrates the front of the unit.

After the gas supply piping has been installed, the bottom opening in the unit should be sealed to prevent water from leaking into the building.

Gas piping recommendations:

1. A drip leg and a ground joint union must be installed in the gas piping.

2. When required by local codes, a manual shut-off valve may have to be installed outside of the unit.

3. Use wrought iron or steel pipe for all gas lines. Pipe compound should be applied sparingly to male threads only.

⚠WARNING

Natural gas may contain some propane. Propane, being an excellent solvent, will quickly dissolve white lead or most standard commercial compounds. Therefore, a special pipe compound must be applied when wrought iron or steel pipe is used. Shellac base compounds such as Gaskolac or Stalastic, and compounds such as Rectorseal #5, Clyde's or John Crane may be used.

4. All piping should be cleaned of dirt and scale by hammering on the outside of the pipe and blowing out the loose dirt and scale. Before initial start-up, be sure that all of the gas lines external to the unit have been purged of air.

5. The gas supply should be a separate line and installed in accordance with all safety codes as prescribed under “Limitations”. After the gas connections have been completed, open the main shut-off valve admitting normal gas pressure to the mains. Check all joints for leaks with soap solution or other material suitable for the purpose. **NEVER USE A FLAME**.

⚠WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death or property damage.

Never test for gas leaks with an open flame. use a commerically available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

6. The furnace and its individual manual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psig (3.48kPa).

   The furnace must be isolated from the gas supply piping system by closing its individual manual shut-off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psig (3.48kPa).

7. A 1/8 inch NPT plugged tap, accessible for test gage connection, must be installed immediately upstream of the gas supply connection to the furnace.

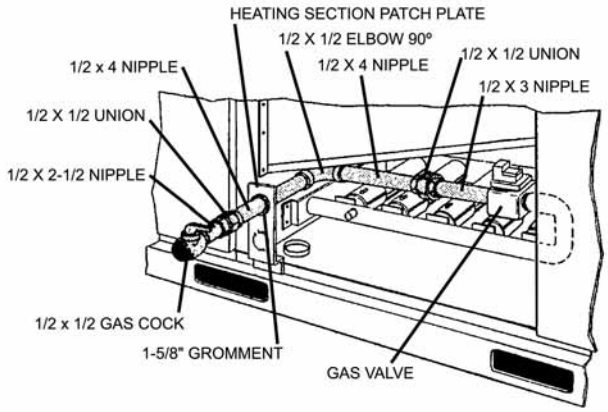


FIGURE 4 - EXTERNAL SUPPLY CONNECTION EXTERNAL SHUT-OFF

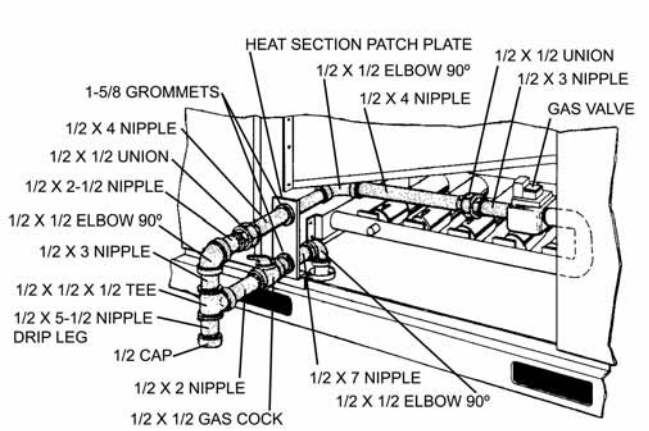


FIGURE 5 - BOTTOM SUPPLY CONNECTION EXTERNAL SHUT-OFF

L.P. UNITS, TANKS AND PIPING

All gas heat units are shipped from the factory equipped for natural gas use only. The unit may be converted in the field for use with L.P./propane gas with accessory kit model number 1NP0440.

All L.P./propane gas equipment must conform to the safety standards of the National Fire Protection Association.

For satisfactory operation, adequate L.P./propane gas pressure must be provided at the unit manifold under full load. Maintaining proper gas pressure depends on three main factors:

1. The vaporization rate depends on (a) the temperature of the liquid and (b) the “wetted surface” area of the container or containers.
2. The proper pressure regulation. (Two-stage regulation is recommended from the standpoint of both cost and efficiency.)
3. The pressure drop in the lines between regulators and between the second stage regulator and the appliance. Pipe size required will depend on the length of the pipe run and the total load of all appliances.

Complete information regarding tank sizing for vaporization, recommended regulator settings, and pipe sizing is available from most regulator manufacturers and L.P./propane gas suppliers.

L.P./propane gas is an excellent solvent and special pipe compound must be used when assembling piping for this gas as it will quickly dissolve white lead or most standard commercial compounds. Shellac base compounds such as Rectorseal #5 are satisfactory for this type of gas.

Check all connections for leaks when piping is completed, using a soap solution. **NEVER USE A FLAME**.

⚠WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death or property damage.

Never test for gas leaks with an open flame. use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

VENT AND COMBUSTION AIR HOODS

The vent hood and combustion air hood (with screens) are shipped attached to the blower housing in the blower compartment. These hoods must be installed to assure proper unit function. All hoods must be fastened to the outside of the gas heat access panel with the screws provided in the bag also attached to the blower housing.

The screen for the combustion air intake hood is secured to the inside of the access panel opening with three fasteners and the screws used for mounting the hood to the panel. The top flange of this hood slips in under the top of the access panel opening when installing. Refer to Vent and Combustion Air Hood Figure 6.

The vent hood is installed by inserting the top flange of the hood into the slotted opening in the access panel and securing in place.

The products of combustion are discharged horizontally through this screened, hooded vent openings on the gas heat access panel.

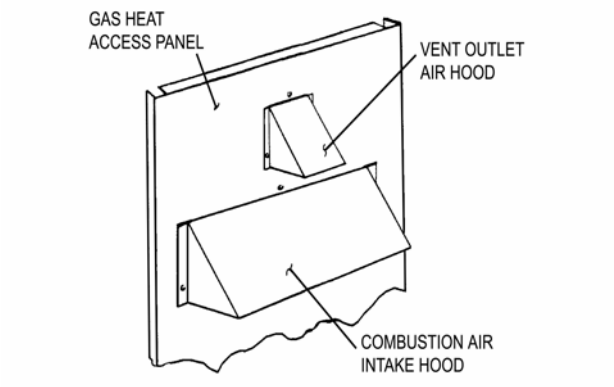


FIGURE 6 - VENT AND COMBUSTION AIR HOOD

⚠ CAUTION

An adhesive backed label is provided over the outside of the combustion air inlet opening to prevent moisture from entering the unit, which could cause damage to electrical components. Allow this closure label to remain in place until the combustion air hood is to be installed.

ECONOMIZER/MOTORIZED DAMPER AND RAIN HOOD

The instruction for the optional economizer/motorized damper and rain hood can be found in form 035-07364-000. Use these instructions when field assembling an economizer rain hood onto a unit. The outdoor and return air dampers, the damper actuator, the damper linkage, the outdoor and return air divider baffles, and all the control sensors are factory mounted as part of the “Factory installed” economizer option.

POWER EXHAUST/BAROMETRIC RELIEF DAMPER AND RAIN HOOD

The instructions for the power exhaust/barometric relief damper and rain hood can be found in form 530.18-N1.10V.

All of the components, including the dampers, hardware, and mounting instructions are shipped in a single package external from the unit and must be field assembled and installed.

Power exhaust is only available as a field installed accessory.

ECONOMIZER AND POWER EXHAUST DAMPER SET POINT ADJUSTMENTS AND INFORMATION

Remove the economizer access panel from the unit. Loosen but do not remove the two panel latches. Locate the economizer control module, where the following adjustments will be made.

⚠ CAUTION

Extreme care must be excercised in turning all setpoint, maximium, and minimum damper positioning adjustment screws to prevent twisting them off.

Check that the damper blades move smoothly without binding; carefully turn the Minimum Position Adjusting screw (found on the damper control module) fully clockwise and then set the thermostat indoor fan switch to the on position and then off, or energize and de-energize terminals “R” to “G”.

MINIMUM POSITION ADJUSTMENT

With thermostat set to indoor fan on position, or terminals “R” to “G” energized, turn the Minimum Position Adjusting screw (located on the damper control module) counterclockwise until the desired minimum damper position has been attained.

ENTHALPY SET POINT ADJUSTMENT

The enthalpy set point may now be set by selecting the desired setpoint shown in the Enthalpy Setpoint Adjustment Figure 7. Adjust as follows:

- For a single enthalpy operation carefully turn the set point adjusting screw (found on the damper control module) to the “A”, “B”, “C” or “D” setting corresponding to the lettered curve of the Enthalpy Setpoint Adjustment Figure 7.
- For a dual enthalpy operation, carefully turn the set point adjusting screw fully clockwise past the “D” setting.

POWER EXHAUST DAMPER SETPOINT (WITH OR WITHOUT POWER EXHAUST)

- With no power exhaust option, adjust the Exhaust Air Adjustment Screw fully clockwise.
- With power exhaust option, each building pressurization requirement will be different. The point at which the power exhaust comes on is determined by the economizer damper position (Percent Open). The Exhaust Air Adjustment Screw should be set at the Percent Open of the economizer damper at which the power exhaust is needed. It can be set from 0 to 100% damper open.

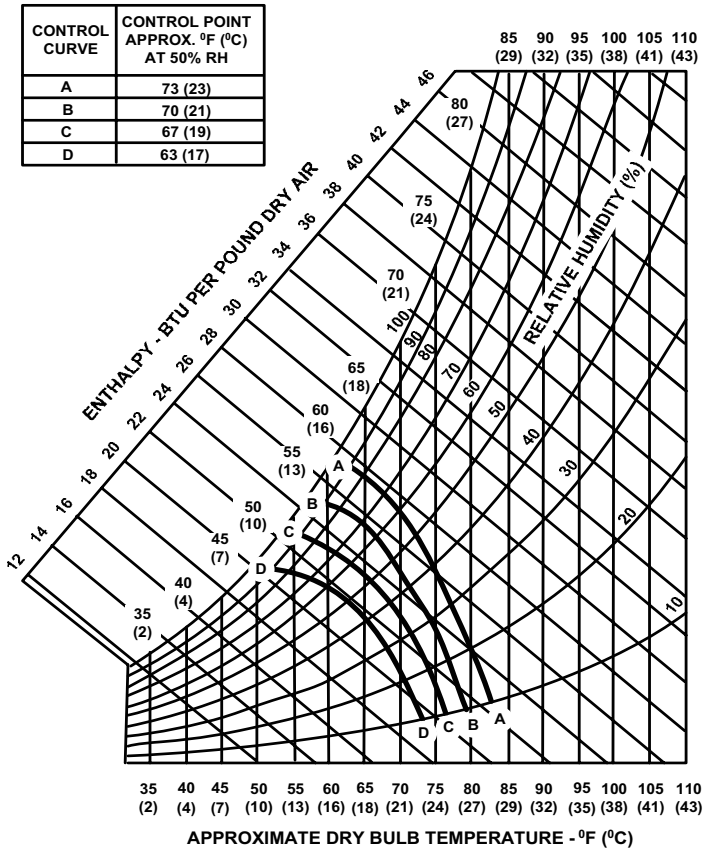

CONTROL CURVE
CONTROL POINT APPROX. °F (°C) AT 50% RH
A 73 (23)
B 70 (21)
C 67 (19)
D 63 (17)
ENTHALPY - BTU PER POUND DRY AIR
RELATIVE HUMIDITY (%)
APPROXIMATE DRY BULB TEMPERATURE - °F (°C)

FIGURE 7 - ENTHALPY SETPOINT ADJUSTMENT

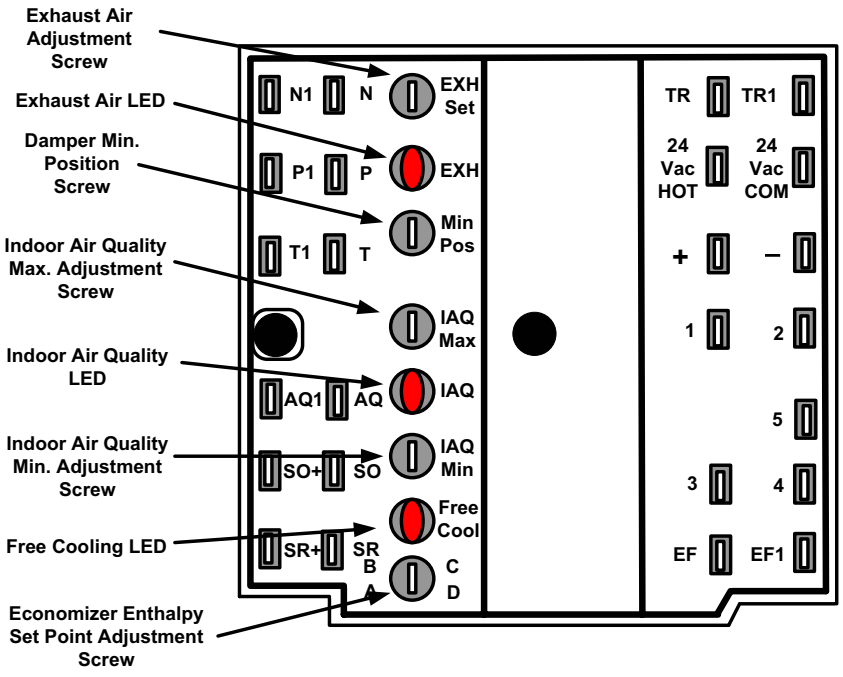


FIGURE 8 - HONEYWELL ECONOMIZER CONTROL W7212

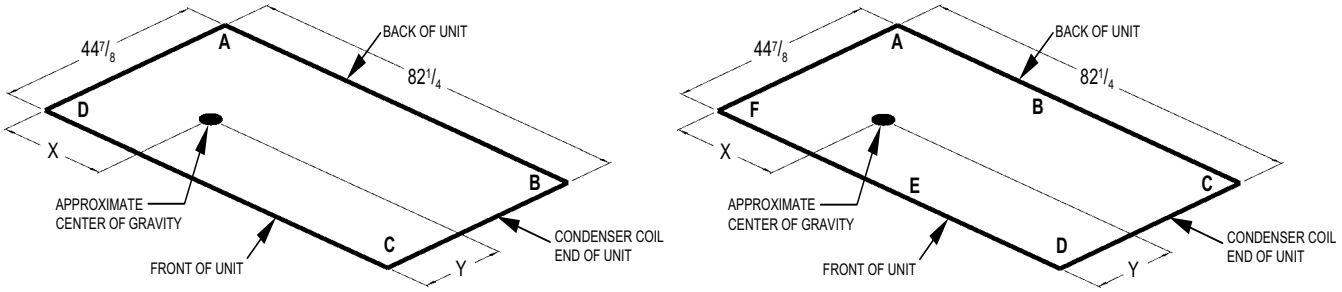


FIGURE 9 - FOUR AND SIX POINT LOADING

TABLE 6: CENTER OF GRAVITY (ALL MODELS)

DIMENSION	3 - 5 TON	6 TON
X	40-¾"	44"
Y	19-¾"	22"

TABLE 7: D(CE, CG) 4 AND 6 POINT LOADS WEIGHT DISTRIBUTION

UNIT	TOTAL	4-Point Loading (lb)				6-Point Loading (lb)					
		A	B	C	D	A	B	C	D	E	F
DCE036 Cooling/ Electric	**565**	125	123	157	160	84	83	82	104	105	107
DCG036N040	**605**	134	132	168	171	90	89	88	112	113	114
DCG036N079	**625**	139	136	173	177	93	92	91	115	117	118
DCE048 Cooling/ Electric	**615**	137	134	171	174	91	90	89	113	115	116
DCG048N060	**665**	148	145	184	188	99	98	96	123	124	126
DCG048N099	**685**	152	149	190	194	102	100	99	126	128	129
DCE060 Cooling/ Electric	**640**	142	140	178	181	95	94	93	118	119	121
DCG060N079	**700**	155	153	194	198	104	103	101	129	131	132
DCG060N099	**710**	158	155	197	201	105	104	103	131	132	134
DCE072 Cooling/ Electric	**720**	160	157	200	203	107	106	104	133	134	136
DCG072N079	**780**	173	170	216	220	116	114	113	144	146	147
DCG072N099	**790**	175	172	219	223	117	116	114	146	147	149

TABLE 8: D(HE, HG) 4 AND 6 POINT LOADS WEIGHT DISTRIBUTION

UNIT	TOTAL	4-Point Loading (lb)				6-Point Loading (lb)					
		A	B	C	D	A	B	C	D	E	F
DHE036 Cooling/ Electric	**565**	125	123	157	160	84	83	82	104	105	107
DHG036N040	**605**	134	132	168	171	90	89	88	112	113	114
DHG036N079	**625**	139	136	173	177	93	92	91	115	117	118
DHE048 Cooling/ Electric	**610**	135	133	169	172	91	89	88	112	114	115
DHG048N060	**660**	147	144	183	186	98	97	96	122	123	125
DHG048N099	**680**	151	148	189	192	101	100	99	125	127	128
DHE060 Cooling/ Electric	**645**	143	141	179	182	96	95	93	119	120	122
DHG060N079	**705**	157	154	196	199	105	103	102	130	132	133
DHG060N099	**715**	159	156	198	202	106	105	104	132	133	135

TABLE 9: D(CE, CG) PHYSICAL DATA

MODELS		D(CE, CG)			
		036	048	060	072
EVAPORATOR BLOWER	Centrifugal Blower (Dia. x Wd. in.)	12 X 10	12 X 10	12 X 10	12 X 11
	Fan Motor HP (Direct Drive)	1/2	3/4	1	1
	Fan Motor HP (Belt Drive)	1 1/2	1 1/2	1 1/2	1 1/2
EVAPORATOR COIL	Rows Deep	3	3	3	4
	Fins Per Inch	13	13	13	13
	Face Area (Sq. Ft.)	3.6	4.3	5.1	5.1
CONDENSER FANS	Propeller Dia. (in.)	24	24	24	24
	Fan Motor Hp	1/4	1/4	1/4	1/4
	Nom. CFM	3400	3400	3400	3400
CONDENSER COILS	Rows Deep	1	1	1	2
	Fins Per Inch	16	16	22	16
	Face Area (Sq. Ft.)	17.1	17.1	17.1	16.7
COMPRESSOR (Qty. Per Unit)	Scroll Type	1	1	1	1
AIR FILTERS	Quantity Per Unit (15” X 20” X 1” or 2“)	2	2	2	2
	Quantity Per Unit (14” X 25” X 1” or 2“)	1	1	1	1
	Total Face Area (sq. ft.)	6.3	6.3	6.3	6.3
CHARGE	Refrigerant 22 (lbs./oz.)	5/8	6/8	6/8	10/0

TABLE 10: D(CE, CG) OPERATING WEIGHTS (LBS.)

MODEL SIZE			3 TON	4 TON	5 TON	6 TON
BASIC UNIT	DCE (Cooling Only)		565	615	640	720
	DCG (Gas/Electric)	N040	605	-	-	-
		N060	-	665	-	-
		N079	625	-	700	780
		N099	-	685	710	790
OPTIONS OR ACCY.	Economizer		50			
	Motorized Damper		26			
	Electric Heater	5 - 7 kW	18			
		10 - 15 kW	23			
		20 - 30 kW	28			
	Roof Curb		92			
	Barometric Relief / Fixed Air Damper		10			
	Belt-Drive Blower		5			

TABLE 11: D(HE, HG) PHYSICAL DATA

MODELS		D(HE, HG)		
		036	048	060
EVAPORATOR BLOWER	Centrifugal Blower (Dia. x Wd. in.)	12 X 10	12 X 10	12 X 10
	Fan Motor HP (Belt Drive)	1 1/2	1 1/2	1 1/2
EVAPORATOR COIL	Rows Deep	4	4	4
	Fins Per Inch	13	13	13
	Face Area (Sq. Ft.)	4.3	5.1	5.1
CONDENSER FANS	Propeller Dia. (in.)	24	24	24
	Fan Motor Hp	1/2	1/2	1/2
	Nom. CFM	4500	4200	4200
CONDENSER COILS	Rows Deep	2	2	2
	Fins Per Inch	18	18	18
	Face Area (Sq. Ft.)	17.1	17.1	17.1
COMPRESSOR (Qty. Per Unit)	Recip. Type	1	1	1
AIR FILTERS	Quantity Per Unit (15” X 20” X 1” or 2“)	2	2	2
	Quantity Per Unit (14” X 25” X 1” or 2“)	1	1	1
	Total Face Area (sq. ft.)	6.3	6.3	6.3
CHARGE	Refrigerant 22 (lbs./oz.)	10/8	10/4	10/14

TABLE 12: D(HE, HG) OPERATING WEIGHTS (LBS.)

MODEL SIZE			3 TON	4 TON	5 TON
BASIC UNIT	DHE (Cooling Only)		565	610	645
	DHG (Gas/Electric)	N040	605	-	-
		N060	-	660	-
		N079	625	-	705
		N099	-	680	715
OPTIONS OR ACCY.	Economizer		50		
	Motorized Damper		26		
	Electric Heater	5 - 7 kW	18		
		10 - 15 kW	23		
		20 - 30 kW	28		
	Roof Curb		92		
	Barometric Relief / Fixed Air Damper		10		
	Belt-Drive Blower		5		

TABLE 13: ELECTRICAL DATA - D(CE, CG) 036-072 DIRECT DRIVE

MODEL TONNAGE	VOLTAGE	COMPRESSORS		OD FAN MOTOR FLA	ID BLOWER MOTOR FLA	ELECTRIC HEATER MODEL NO.	HEATER KW	HEATER AMPS	MIN. CIRCUIT AMPACITY (AMPS)	MAX. FUSE/ BRKR[1] SIZE (AMPS)
		RLA EACH	LRA EACH							
D(CE, CG) 036 (3.0)	208-3-60	11.4	90.0	1.3	4.4	None	--	--	19.9	25
						2CE04510525[2]	4	11.1	19.9	25
						2CE04510725[2]	5.6	15.5	24.9	30
						2CE04511025	8	22.2	33.3	35
						2CE04511525	11.9	33.0	46.8	50
						2CE04512025	15.9	44.1	60.7	70
	230-3-60	11.4	90.0	1.3	4.4	None	--	--	19.9	25
						2CE04510525[2]	5.3	12.7	21.4	30
						2CE04510725[2]	7.5	18.0	28.1	30
						2CE04511025	10.6	25.5	37.4	40
						2CE04511525	15.9	38.2	53.3	60
						2CE04512025	21.2	51.0	69.2	70
	460-3-60	6.2	45.0	0.8	2.2	None	--	--	10.8	15
						2CE04510746[2]	6.8	8.2	13	15
						2CE04511046[2]	10.1	12.1	17.9	20
						2CE04511546[2]	13.6	16.4	23.2	25
						2CE04512046[2]	19.5	23.5	32.1	35
	575-3-60	5.0	36.0	0.8	2.2	None	--	--	8.7	15
						2CE04511058	10.6	10.2	14.9	15
						2CE04511558	15.9	15.3	21.3	25
						2CE04512058	21.2	20.4	27.7	30
D(CE, CG) 048 (4.0)	208-3-60	14.1	105.0	1.3	5.0	None	--	--	23.9	30
						2CE04510525[2]	4	11.1	23.9	30
						2CE04510725[2]	5.6	15.5	25.7	35
						2CE04511025	8	22.2	34	35
						2CE04511525	11.9	33.0	47.5	50
						2CE04512025	15.9	44.1	61.4	70
	230-3-60	14.1	105.0	1.3	5.0	None	--	--	23.9	30
						2CE04510525[2]	5.3	12.7	23.9	30
						2CE04510725[2]	7.5	18.0	28.8	35
						2CE04511025	10.6	25.5	38.1	40
						2CE04511525	15.9	38.2	54.1	60
						2CE04512025	21.2	51.0	70	70
	460-3-60	7.1	55.0	0.8	2.2	None	--	--	11.9	15
						2CE04510746[2]	6.8	8.2	13	15
						2CE04511046[2]	10.1	12.1	17.9	20
						2CE04511546[2]	13.6	16.4	23.2	25
						2CE04512046[2]	19.5	23.5	32.1	35
	575-3-60	5.8	44.0	0.8	2.2	None	--	--	9.7	15
						2CE04511058	10.6	10.2	14.9	15
						2CE04511558	15.9	15.3	21.3	25
						2CE04512058	21.2	20.4	27.7	30

TABLE 13: ELECTRICAL DATA - D(CE, CG) 036-072 DIRECT DRIVE (CONT.)

MODEL TONNAGE	VOLTAGE	COMPRESSORS		OD FAN MOTOR FLA	ID BLOWER MOTOR FLA	ELECTRIC HEATER MODEL NO.	HEATER KW	HEATER AMPS	MIN. CIRCUIT AMPACITY (AMPS)	MAX. FUSE/ BRKR[1] SIZE (AMPS)
		RLA EACH	LRA EACH							
D(CE, CG) 060 (5.0)	208-3-60	16.0	125.0	1.3	6.6	None	--	--	27.9	35
						2CE04510525[2]	4	11.1	27.9	35
						2CE04510725[2]	5.6	15.5	27.9	35
						2CE04511025	8	22.2	36	40
						2CE04511525	11.9	33.0	49.5	50
						2CE04512025	15.9	44.1	63.4	70
						2CE04513025	22.2	61.6	85.3	90
	230-3-60	16.0	125.0	1.3	6.6	None	--	--	27.9	35
						2CE04510525[2]	5.3	12.7	27.9	35
						2CE04510725[2]	7.5	18.0	30.8	40
						2CE04511025	10.6	25.5	40.1	45
						2CE04511525	15.9	38.2	56.1	60
						2CE04512025	21.2	51.0	72	80
						2CE04513025	29.6	71.2	97.3	100
	460-3-60	8.0	66.5	0.8	3.3	None	--	--	14.1	20
						2CE04510746[2]	6.8	8.2	14.3	20
						2CE04511046[2]	10.1	12.1	19.3	20
						2CE04511546[2]	13.6	16.4	24.6	25
						2CE04512046[2]	19.5	23.5	33.4	35
						2CE04513046[2]	28.8	34.6	47.4	50
	575-3-60	6.4	50.0	0.8	3.3	None	--	--	11.3	15
						2CE04511058	10.6	10.2	16	20
						2CE04511558	15.9	15.3	22.4	25
						2CE04512058	21.2	20.4	28.8	30
						2CE04513058	30.4	29.3	39.9	40
D(CE, CG) 072 (6.0)	208-3-60	18.9	146.0	1.3	6.8	None	--	--	31.7	40
						2CE04510525[2]	4	11.1	31.7	40
						2CE04510725[2]	5.6	15.5	31.7	40
						2CE04511025	8	22.2	36.3	50
						2CE04511525	11.9	33.0	49.8	50
						2CE04512025	15.9	44.1	63.7	70
						2CE04513025	22.2	61.6	85.5	90
	230-3-60	18.9	146.0	1.3	6.8	None	--	--	31.7	40
						2CE04510525[2]	5.3	12.7	31.7	40
						2CE04510725[2]	7.5	18.0	31.7	40
						2CE04511025	10.6	25.5	40.4	50
						2CE04511525	15.9	38.2	56.3	60
						2CE04512025	21.2	51.0	72.2	80
						2CE04513025	29.6	71.2	97.5	100
	460-3-60	9.5	73.0	0.8	3.6	None	--	--	16.3	25
						2CE04510746[2]	6.8	8.2	16.3	25
						2CE04511046[2]	10.1	12.1	19.7	25
						2CE04511546[2]	13.6	16.4	24.9	25
						2CE04512046[2]	19.5	23.5	33.8	35
						2CE04513046[2]	28.8	34.6	47.8	50
	575-3-60	7.6	58.4	0.8	3.6	None	--	--	13	15
						2CE04511058	10.6	10.2	16.3	20
						2CE04511558	15.9	15.3	22.7	25
						2CE04512058	21.2	20.4	29.1	30
						2CE04513058	30.4	29.3	40.2	40

1. HACR Type per NEC.
2. These electric heaters do not include a fuse box. If a fuse box is required to meet a local code (i.e. Chicago), the fuse block accessories 2FB04700825 and 2FB04700846 are available for field installation.

TABLE 14: ELECTRICAL DATA - D(CE, CG) 036-072 BELT DRIVE

MODEL TONNAGE	VOLTAGE	COMPRESSORS		OD FAN MOTOR FLA	ID BLOWER MOTOR FLA	ELECTRIC HEATER MODEL NO.	HEATER KW	HEATER AMPS	MIN. CIRCUIT AMPACITY (AMPS)	MAX. FUSE/ BRKR[1] SIZE (AMPS)
		RLA EACH	LRA EACH							
D(CE, CG) 036 (3.0)	208-3-60	11.4	90.0	1.3	5.2	None	--	--	20.8	30
						2CE04510525[2]	4	11.1	20.8	30
						2CE04510725[2]	5.6	15.5	25.9	30
						2CE04511025	8	22.2	34.3	35
						2CE04511525	11.9	33.0	47.8	50
						2CE04512025	15.9	44.1	61.7	70
	230-3-60	11.4	90.0	1.3	5.2	None	--	--	20.8	30
						2CE04510525[2]	5.3	12.7	22.4	30
						2CE04510725[2]	7.5	18.0	29.1	30
						2CE04511025	10.6	25.5	38.4	40
						2CE04511525	15.9	38.2	54.3	60
						2CE04512025	21.2	51.0	70.2	80
	460-3-60	6.2	45.0	0.8	2.6	None	--	--	11.1	15
						2CE04510746[2]	6.8	8.2	13.5	15
						2CE04511046[2]	10.1	12.1	18.4	20
						2CE04511546[2]	13.6	16.4	23.7	25
						2CE04512046[2]	19.5	23.5	32.6	35
	575-3-60	5.0	36.0	0.8	2.0	None	--	--	8.9	15
						2CE04511058	10.6	10.2	15.2	20
						2CE04511558	15.9	15.3	21.6	25
						2CE04512058	21.2	20.4	28	30
D(CE, CG) 048 (4.0)	208-3-60	14.1	105.0	1.3	5.2	None	--	--	24.1	35
						2CE04510525[2]	4	11.1	24.1	35
						2CE04510725[2]	5.6	15.5	25.9	35
						2CE04511025	8	22.2	34.3	35
						2CE04511525	11.9	33.0	47.8	50
						2CE04512025	15.9	44.1	61.7	70
	230-3-60	14.1	105.0	1.3	5.2	None	--	--	24.1	35
						2CE04510525[2]	5.3	12.7	24.1	35
						2CE04510725[2]	7.5	18.0	29.1	35
						2CE04511025	10.6	25.5	38.4	40
						2CE04511525	15.9	38.2	54.3	60
						2CE04512025	21.2	51.0	70.2	80
	460-3-60	7.1	55.0	0.8	2.6	None	--	--	12.3	15
						2CE04510746[2]	6.8	8.2	13.5	15
						2CE04511046[2]	10.1	12.1	18.4	20
						2CE04511546[2]	13.6	16.4	23.7	25
						2CE04512046[2]	19.5	23.5	32.6	35
	575-3-60	5.8	44.0	0.8	2.0	None	--	--	9.9	15
						2CE04511058	10.6	10.2	15.2	20
						2CE04511558	15.9	15.3	21.6	25
						2CE04512058	21.2	20.4	28	30

TABLE 14: ELECTRICAL DATA - D(CE, CG) 036-072 BELT DRIVE (CONT.)

MODEL TONNAGE	VOLTAGE	COMPRESSORS		OD FAN MOTOR FLA	ID BLOWER MOTOR FLA	ELECTRIC HEATER MODEL NO.	HEATER KW	HEATER AMPS	MIN. CIRCUIT AMPACITY (AMPS)	MAX. FUSE/ BRKR[1] SIZE (AMPS)
		RLA EACH	LRA EACH							
D(CE, CG) 060 (5.0)	208-3-60	16.0	125.0	1.3	5.2	None	--	--	26.5	35
						2CE04510525[2]	4	11.1	26.5	35
						2CE04510725[2]	5.6	15.5	26.5	35
						2CE04511025	8	22.2	34.3	40
						2CE04511525	11.9	33.0	47.8	50
						2CE04512025	15.9	44.1	61.7	70
						2CE04513025	22.2	61.6	83.5	90
	230-3-60	16.0	125.0	1.3	5.2	None	--	--	26.5	35
						2CE04510525[2]	5.3	12.7	26.5	35
						2CE04510725[2]	7.5	18.0	29.1	40
						2CE04511025	10.6	25.5	38.4	40
						2CE04511525	15.9	38.2	54.3	60
						2CE04512025	21.2	51.0	70.2	80
						2CE04513025	29.6	71.2	95.5	100
	460-3-60	8.0	66.5	0.8	2.6	None	--	--	13.4	20
						2CE04510746[2]	6.8	8.2	13.5	20
						2CE04511046[2]	10.1	12.1	18.4	20
						2CE04511546[2]	13.6	16.4	23.7	25
						2CE04512046[2]	19.5	23.5	32.6	35
						2CE04513046[2]	28.8	34.6	46.6	50
	575-3-60	6.4	50.0	0.8	2.0	None	--	--	10.6	15
						2CE04511058	10.6	10.2	15.2	20
						2CE04511558	15.9	15.3	21.6	25
						2CE04512058	21.2	20.4	28	30
						2CE04513058	30.4	29.3	39.1	40
D(CE, CG) 072 (6.0)	208-3-60	18.9	146.0	1.3	5.0	None	--	--	29.9	40
						2CE04510525[2]	4	11.1	29.9	40
						2CE04510725[2]	5.6	15.5	29.9	40
						2CE04511025	8	22.2	34	45
						2CE04511525	11.9	33.0	47.5	50
						2CE04512025	15.9	44.1	61.4	70
						2CE04513025	22.2	61.6	83.3	90
	230-3-60	18.9	146.0	1.3	5.0	None	--	--	29.9	40
						2CE04510525[2]	5.3	12.7	29.9	40
						2CE04510725[2]	7.5	18.0	29.9	40
						2CE04511025	10.6	25.5	38.1	45
						2CE04511525	15.9	38.2	54.1	60
						2CE04512025	21.2	51.0	70	70
						2CE04513025	29.6	71.2	95.3	100
	460-3-60	9.5	73.0	0.8	2.5	None	--	--	15.2	20
						2CE04510746[2]	6.8	8.2	15.2	20
						2CE04511046[2]	10.1	12.1	18.3	20
						2CE04511546[2]	13.6	16.4	23.6	25
						2CE04512046[2]	19.5	23.5	32.4	35
						2CE04513046[2]	28.8	34.6	46.4	50
	575-3-60	7.6	58.4	0.8	2.0	None	--	--	12.1	15
						2CE04511058	10.6	10.2	15.2	20
						2CE04511558	15.9	15.3	21.6	25
						2CE04512058	21.2	20.4	28	30
						2CE04513058	30.4	29.3	39.1	40

1. HACR Type per NEC.
2. These electric heaters do not include a fuse box. If a fuse box is required to meet a local code (i.e. Chicago), the fuse block accessories 2FB04700825 and 2FB04700846 are available for field installation.

TABLE 15: ELECTRICAL DATA - D(HE, HG) 036-060 BELT DRIVE

MODEL TONNAGE	VOLTAGE	COMPRESSORS		OD FAN MOTOR FLA	ID BLOWER MOTOR FLA	ELECTRIC HEATER MODEL NO.	HEATER KW	HEATER AMPS	MIN. CIRCUIT AMPACITY (AMPS)	MAX. FUSE/ BRKR[1] SIZE (AMPS)
		RLA EACH	LRA EACH							
D(HE, HG) 036 (3.0)	208-3-60	13.1	110.0	2.3	5.2	None	--	--	23.9	30
						2CE04510525[2]	4.0	11.1	23.9	30
						2CE04510725[2]	5.6	15.5	25.9	35
						2CE04511025	8.0	22.2	34.3	35
						2CE04511525	11.9	33.0	47.8	50
						2CE04512025	15.9	44.1	61.7	70
	230-3-60	13.1	110.0	2.3	5.2	None	--	--	23.9	30
						2CE04510525[2]	5.3	12.7	23.9	30
						2CE04510725[2]	7.5	18.0	29.1	35
						2CE04511025	10.6	25.5	38.4	40
						2CE04511525	15.9	38.2	54.3	60
						2CE04512025	21.2	51.0	70.2	80
	460-3-60	6.7	54.0	1.3	2.6	None	--	--	12.3	15
						2CE04510746[2]	6.8	8.2	13.5	15
						2CE04511046[2]	10.1	12.1	18.4	20
						2CE04511546[2]	13.6	16.4	23.7	25
						2CE04512046[2]	19.5	23.5	32.6	35
D(HE, HG) 048 (4.0)	208-3-60	13.1	110.0	2.3	5.2	None	--	--	23.9	30
						2CE04510525[2]	4.0	11.1	23.9	30
						2CE04510725[2]	5.6	15.5	25.9	35
						2CE04511025	8.0	22.2	34.3	35
						2CE04511525	11.9	33.0	47.8	50
						2CE04512025	15.9	44.1	61.7	70
	230-3-60	13.1	110.0	2.3	5.2	None	--	--	23.9	30
						2CE04510525[2]	5.3	12.7	23.9	30
						2CE04510725[2]	7.5	18.0	29.1	35
						2CE04511025	10.6	25.5	38.4	40
						2CE04511525	15.9	38.2	54.3	60
						2CE04512025	21.2	51.0	70.2	80
	460-3-60	6.7	54.0	1.3	2.6	None	--	--	12.3	15
						2CE04510746[2]	6.8	8.2	13.5	15
						2CE04511046[2]	10.1	12.1	18.4	20
						2CE04511546[2]	13.6	16.4	23.7	25
						2CE04512046[2]	19.5	23.5	32.6	35
	575-3-60	5.1	44.0	1.3	2.0	None	--	--	9.4	15
						2CE04511058	10.6	10.2	15.2	20
						2CE04511558	15.9	15.3	21.6	25
						2CE04512058	21.2	20.4	28.0	30

TABLE 15: ELECTRICAL DATA - D(HE, HG) 036-060 BELT DRIVE (CONT.)

MODEL TONNAGE	VOLTAGE	COMPRESSORS		OD FAN MOTOR FLA	ID BLOWER MOTOR FLA	ELECTRIC HEATER MODEL NO.	HEATER KW	HEATER AMPS	MIN. CIRCUIT AMPACITY (AMPS)	MAX. FUSE/ BRKR[1] SIZE (AMPS)
		RLA EACH	LRA EACH							
D(HE, HG) 060 (5.0)	208-3-60	16.0	137.0	2.3	5.2	None	--	--	27.5	35
						2CE04510525[2]	4.0	11.1	27.5	35
						2CE04510725[2]	5.6	15.5	27.5	35
						2CE04511025	8.0	22.2	34.3	40
						2CE04511525	11.9	33.0	47.8	50
						2CE04512025	15.9	44.1	61.7	70
						2CE04513025	22.2	61.6	83.5	90
	230-3-60	16.0	137.0	2.3	5.2	None	--	--	27.5	35
						2CE04510525[2]	5.3	12.7	27.5	35
						2CE04510725[2]	7.5	18.0	29.1	40
						2CE04511025	10.6	25.5	38.4	40
						2CE04511525	15.9	38.2	54.3	60
						2CE04512025	21.2	51.0	70.2	80
						2CE04513025	29.6	71.2	95.5	100
	460-3-60	8.3	69.0	1.3	2.6	None	--	--	14.3	20
						2CE04510746[2]	6.8	8.2	14.3	20
						2CE04511046[2]	10.1	12.1	18.4	20
						2CE04511546[2]	13.6	16.4	23.7	25
						2CE04512046[2]	19.5	23.5	32.6	35
						2CE04513046[2]	28.8	34.6	46.6	50
	575-3-60	6.4	58.0	1.3	2.0	None	--	--	11.0	15
						2CE04511058	10.6	10.2	15.2	20
						2CE04511558	15.9	15.3	21.6	25
						2CE04512058	21.2	20.4	28.0	30
						2CE04513058	30.4	29.3	39.1	40

1. HACR Type per NEC.
2. These electric heaters do not include a fuse box. If a fuse box is required to meet a local code (i.e. Chicago), the fuse block accessories 2FB04700825 and 2FB04700846 are available for field installation.

TABLE 16: ELECTRIC HEAT CORRECTION FACTORS

NOMINAL VOLTAGE	VOLTAGE	kW CAP. MULTIPLIER
208	208	0.75
240	230	0.92
480	460	0.92
600	575	0.92

TABLE 17: VOLTAGE LIMITATIONS[1]

POWER SUPPLY	VOLTAGE	
	MIN.	MAX.
208/230-3-60	187	252
460-3-60	432	504
575-3-60	540	630

1. Utilization Range “A” in accordance with ARI Standard 110.

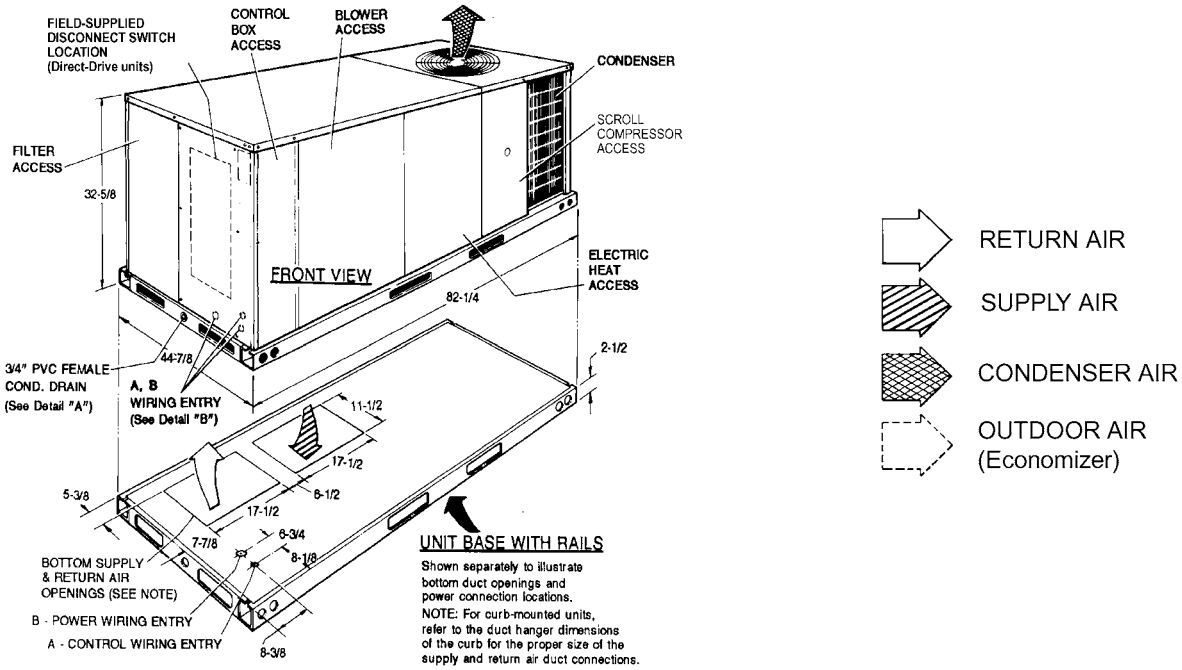


FIGURE 10 - UNIT DIMENSIONS (3 - 6 TON COOLING ONLY/ELECTRIC HEAT) FRONT VIEW

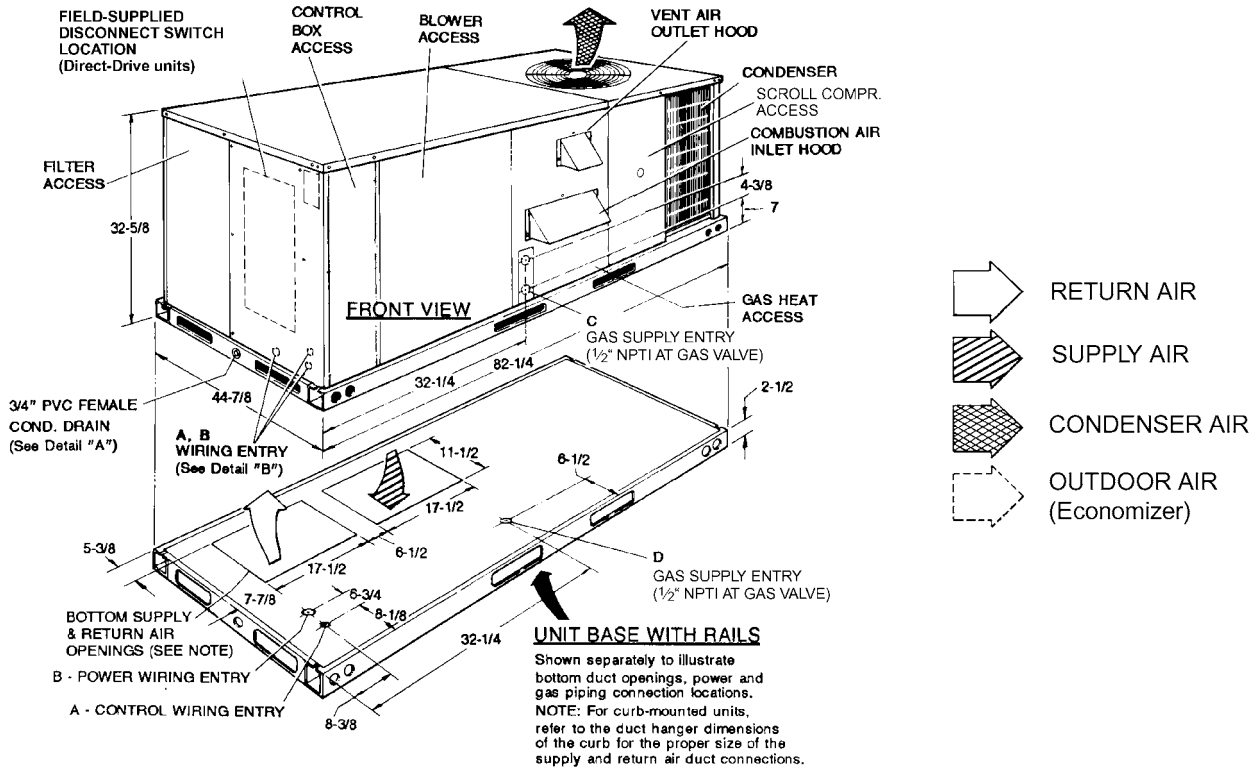


FIGURE 11 - UNIT DIMENSIONS (3 - 6 TON COOLING/GAS HEAT) FRONT VIEW

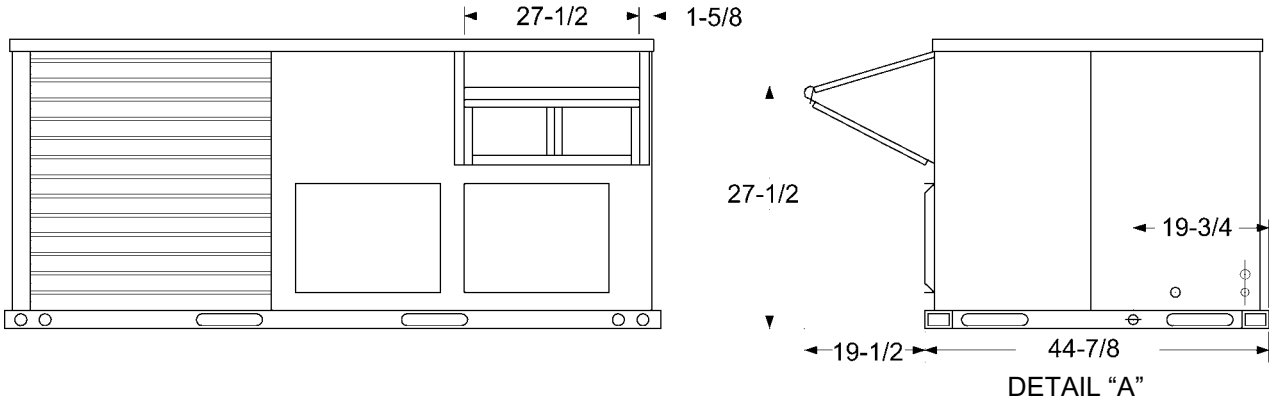
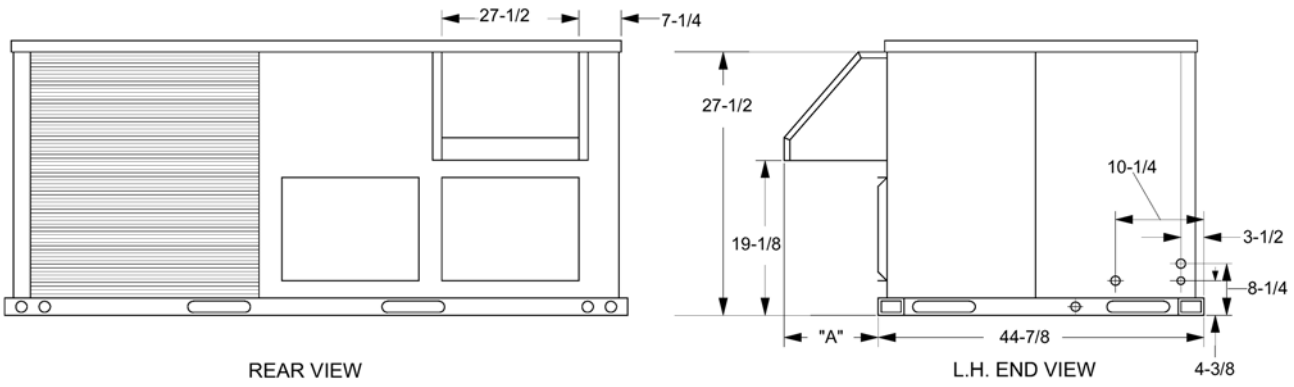


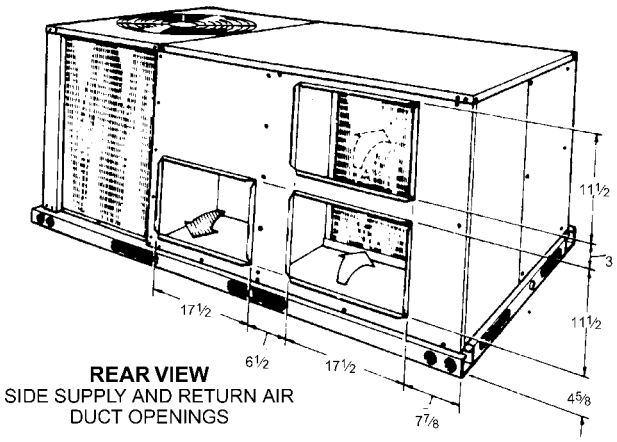
FIGURE 12 - UNIT WITH ECONOMIZER RAINHOOD



DIMENSION "A"	
FIXED OUTDOOR AIR DAMPER	12
MOTORIZED DAMPER	16-1/2

DETAIL “B”

FIGURE 13 - UNIT WITH FIXED OUTDOOR AIR/MOTORIZED DAMPER RAINHOOD



DUCT COVERS - Units are shipped with all air duct openings covered.
For side duct applications;
1. Remove and discard the supply and return air duct covers.
2. Connect ductwork to duct flanges on the rear of the unit.

For bottom duct applications;
1. Remove the side supply air duct cover to gain access to the bottom supply air knockout panel.
2. Remove and discard the bottom knockout panel.
3. Replace the side duct cover.
4. With filter section access panel removed from the unit, remove and discard the bottom return air knockout panel.
5. Replace the filter access panel.

FIGURE 14 - UNIT DIMENSIONS (REAR VIEW)

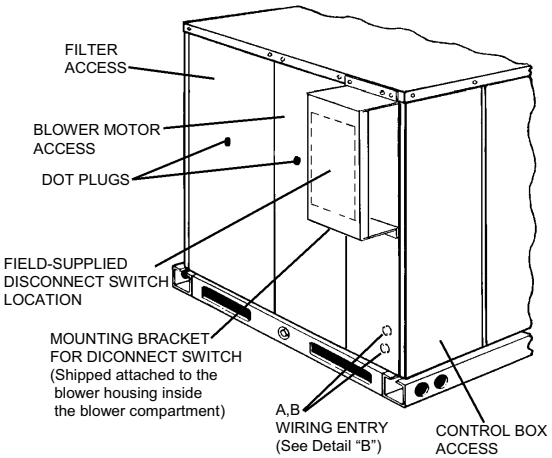

FILTER ACCESS
BLOWER MOTOR ACCESS
DOT PLUGS
FIELD-SUPPLIED DISCONNECT SWITCH LOCATION
MOUNTING BRACKET FOR DICONNECT SWITCH (Shipped attached to the blower housing inside the blower compartment)
A,B WIRING ENTRY (See Detail "B")
CONTROL BOX ACCESS
DISCONNECT SWITCH LOCATION AND MOTOR ACCESS PANEL FOR UNIT WITH "BELT-DRIVE" OPTION

FIGURE 15 - DISCONNECT/BLOWER ACCESS LOCATION

TABLE 18: UTILITIES ENTRY

HOLE	OPENING SIZE (DIA.)	USED FOR	
A	7/8" KO[1]	Control Wiring[2]	Side
			Bottom
B	2" KO[1]	Power Wiring	Side
			Bottom
C	1-5/8" KO	Gas Piping (Front)	
D	1-1/2" KO	Gas Piping (Bottom)	

1. Opening in the bottom to the unit can be located by the side in the insulation.
2. Do not remove the 2" knockout ring.

TABLE 19: MINIMUM CLEARANCES

LOCATION	CLEARANCE
Front	24" (Cooling/Electric Heat) 32" (Gas Heat)
Rear	12" (Less Economizer) 36" (With Economizer or Fixed Air/Motorized Damper)
Left Side (Filter Access)	24" (Less Economizer) 36" (With Economizer)
Right Side (Cond. Coil)	24"
Below Unit[1]	0"
Above Unit[2]	72" (For Condenser Air Discharge)

1. Units may be installed on combustible floors made from wood or class A, B, or C roof covering material.
2. Units must be installed outdoors. Overhanging structures or shrubs should not obstruct condenser air discharge outlet.

TABLE 20: SUPPLY AIR BLOWER PERFORMANCE (3 TON BELT DRIVE) - SIDE DUCT APPLICATION

UNIT TONNAGE	AIR FLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE-IWG[3]													
		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
		RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS
3[1,2]	1700	835	705	880	745	923	795	969	860	1013	970	-	-	-	-
	1600	811	655	854	695	898	740	942	790	986	840	1029	900	-	-
	1500	782	610	827	650	871	685	917	730	960	775	1003	825	1046	905
	1400	-	-	798	595	844	640	889	680	932	720	975	765	1018	790
	1300	-	-	-	-	816	590	862	635	907	675	951	715	995	750
	1200	-	-	-	-	-	-	834	585	881	630	927	665	970	705
	1100	-	-	-	-	-	-	809	550	855	590	900	625	942	665
	1000	-	-	-	-	-	-	782	510	829	545	872	858	919	625
	900	-	-	-	-	-	-	-	-	797	500	843	540	890	580

UNIT TONNAGE	AIR FLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE-IWG[3]													
		0.90		1.00		1.10		1.20		1.30		1.40		1.50	
		RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS
3[1, 2]	1700	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1600	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1500	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1400	1055	875	-	-	-	-	-	-	-	-	-	-	-	-
	1300	1036	780	1066	850	-	-	-	-	-	-	-	-	-	-
	1200	1011	735	1047	765	1075	800	-	-	-	-	-	-	-	-
	1100	987	690	1028	720	1060	750	1084	775	-	-	-	-	-	-
	1000	963	655	1005	680	1040	695	1068	715	1089	735	-	-	-	-
	900	936	615	980	645	1020	660	1050	670	1053	680	1090	690	-	-

1. 230/460/575 Volts
2. For 208 Volts multiply values by 0.95.
3. Includes allowances for a wet evaporator coil, 1” filters, and the heat exchangers. Refer to STATIC RESISTANCE Table for resistance values on applications other than gas / electric units with side duct airflows.

TABLE 21: SUPPLY AIR BLOWER PERFORMANCE (4 TON BELT DRIVE) - SIDE DUCT APPLICATION

UNIT TONNAGE	AIR FLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE-IWG[3]													
		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
		RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS
4[1, 2]	2000	843	860	880	925	919	1005	956	1065	993	1145	1030	1195	1067	1235
	1900	817	775	854	850	893	920	930	995	970	1065	1008	1125	1046	1170
	1800	790	700	828	760	867	840	906	905	944	980	985	1040	1025	1100
	1700	-	-	802	670	840	745	881	815	920	900	961	970	1001	1030
	1600	-	-	-	-	818	665	858	740	898	820	940	890	980	950
	1500	-	-	-	-	-	-	842	695	882	755	922	835	962	895
	1400	-	-	-	-	-	-	833	650	867	705	904	765	942	820
	1300	-	-	-	-	-	-	-	-	858	665	893	725	932	785
	1200	-	-	-	-	-	-	-	-	847	640	880	680	916	730

UNIT TONNAGE	AIR FLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE-IWG[3]													
		0.90		1.00		1.10		1.20		1.30		1.40		1.50	
		RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS
4[1, 2]	2000	1103	1270	-	-	-	-	-	-	-	-	-	-	-	-
	1900	1085	1210	-	-	-	-	-	-	-	-	-	-	-	-
	1800	1064	1145	1102	1180	-	-	-	-	-	-	-	-	-	-
	1700	1040	1075	1081	1115	1121	1140	-	-	-	-	-	-	-	-
	1600	1020	1005	1060	1050	1100	1085	-	-	-	-	-	-	-	-
	1500	1003	945	1044	995	1086	1035	-	-	-	-	-	-	-	-
	1400	982	880	1024	920	1067	965	1107	1000	-	-	-	-	-	-
	1300	970	835	1010	870	1053	920	1099	960	-	-	-	-	-	-
	1200	953	780	992	815	1034	855	1080	905	-	-	-	-	-	-

1. 230/460/575 Volts
2. For 208 Volts multiply values by 0.95.
3. Includes allowances for a wet evaporator coil, 1” filters, and the heat exchangers. Refer to STATIC RESISTANCE Table for resistance values on applications other than gas / electric units with side duct airflows.

TABLE 22: SUPPLY AIR BLOWER PERFORMANCE (5 TON BELT DRIVE) - SIDE DUCT APPLICATION

UNIT TONNAGE	AIR FLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE-IWG[3]													
		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
		RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS
5[1, 2]	2500	1059	1560	1077	1590	1095	1630	1114	1650	1134	1660	1158	1685	1181	1720
	2400	1032	1405	1054	1470	1074	1525	1094	1560	1116	1595	1140	1620	1167	1640
	2300	1005	1260	1024	1275	1049	1370	1069	1440	1090	1475	1116	1505	1142	1535
	2200	980	1160	1002	1170	1022	1190	1044	1250	1066	1350	1090	1410	1117	1440
	2100	930	1060	957	1070	983	1080	1010	1100	1039	1160	1064	1260	1092	1340
	2000	877	950	908	975	941	1000	976	1020	1009	1050	1040	1100	1070	1225
	1900	-	-	-	-	894	885	940	940	980	980	1014	1020	1047	1095
	1800	-	-	-	-	855	815	903	860	950	905	988	940	1022	970
	1700	-	-	-	-	-	-	884	815	925	850	964	880	1001	910
	1600	-	-	-	-	-	-	864	770	908	805	948	835	987	870
	1500	-	-	-	-	-	-	-	-	882	740	926	780	965	830

UNIT TONNAGE	AIR FLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE-IWG[3]													
		0.90		1.00		1.10		1.20		1.30		1.40		1.50	
		RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS
5[1, 2]	2500	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2400	1193	1665	-	-	-	-	-	-	-	-	-	-	-	-
	2300	1170	1580	1202	1620	-	-	-	-	-	-	-	-	-	-
	2200	1148	1480	1180	1530	-	-	-	-	-	-	-	-	-	-
	2100	1121	1385	1155	1425	1190	1475	-	-	-	-	-	-	-	-
	2000	1100	1285	1133	1340	1169	1385	1205	1445	-	-	-	-	-	-
	1900	1079	1180	1110	1240	1143	1280	1178	1330	1222	1375	-	-	-	-
	1800	1058	1060	1090	1135	1122	1190	1158	1240	1196	1295	-	-	-	-
	1700	1035	960	1071	1030	1103	1100	1134	1140	1164	1175	1197	1205	-	-
	1600	1020	900	1056	965	1088	1035	1118	1065	1145	1105	1170	1130	1198	1150
	1500	1004	860	1038	880	1070	925	1101	980	1130	1045	1158	1075	1184	1110

1. 230/460/575 Volts
2. For 208 Volts multiply values by 0.95.
3. Includes allowances for a wet evaporator coil, 1” filters, and the heat exchangers. Refer to STATIC RESISTANCE Table for resistance values on applications other than gas / electric units with side duct airflows.

TABLE 23: SUPPLY AIR BLOWER PERFORMANCE (6 TON BELT DRIVE) - SIDE DUCT APPLICATION

UNIT TONNAGE	AIR FLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE-IWG[3]													
		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
		RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS
6[1, 2]	3200	1150	2325	1182	2425	1212	2525	-	-	-	-	-	-	-	-
	3000	1100	2010	1129	2090	1157	2150	1185	2225	1215	2290	1242	2360	-	-
	2800	1045	1700	1074	1780	1102	1850	1131	1940	1160	2025	1190	2075	1217	2130
	2600	985	1425	1015	1475	1045	1540	1075	1630	1103	1715	1135	1760	1163	1825
	2400	930	1240	958	1300	990	1350	1020	1400	1051	1430	1081	1490	1111	1600
	2200	-	-	905	1070	933	1160	965	1210	997	1250	1028	1285	1060	1325
	2000	-	-	-	-	-	-	919	1025	950	1100	982	1130	1014	1160
	1800	-	-	-	-	-	-	-	-	909	925	939	1005	968	1030

UNIT TONNAGE	AIR FLOW CFM	AVAILABLE EXTERNAL STATIC PRESSURE-IWG[3]													
		0.90		1.00		1.10		1.20		1.30		1.40		1.50	
		RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS	RPM	WATTS
6[1, 2]	3200	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2800	1245	2190	-	-	-	-	-	-	-	-	-	-	-	-
	2600	1193	1920	1222	1990	1250	2060	-	-	-	-	-	-	-	-
	2400	1142	1675	1173	1730	1205	1800	1234	1885	-	-	-	-	-	-
	2200	1090	1380	1124	1450	1155	1550	1186	1640	1217	1710	1249	1775	-	-
	2000	1045	1175	1077	1200	1109	1275	1140	1360	1170	1460	1205	1545	1235	1600
	1800	998	1050	1028	1060	1058	1060	1087	1075	1118	1150	1148	1250	1176	1360

1. 230/460/575 Volts
2. For 208 Volts multiply values by 0.95.
3. Includes allowances for a wet evaporator coil, 1” filters, and the heat exchangers. Refer to STATIC RESISTANCE Table for resistance values on applications other than gas / electric units with side duct airflows.

TABLE 24: SUPPLY AIR BLOWER PERFORMANCE (3 - 6 TON DIRECT DRIVE) - SIDE DUCT APPLICATION

UNIT TONNAGE	MOTOR SPEED	AVAILABLE EXTERNAL STATIC PRESSURE-IWG[2]									
		0.20		0.30		0.40		0.50		0.60	
		CFM	WATTS	CFM	WATTS	CFM	WATTS	CFM	WATTS	CFM	WATTS
3[1]	HI	-	-	-	-	1699	825	1650	785	1570	755
	MED	1684	800	1631	780	1582	750	1524	720	1410	690
	LOW	1487	710	1464	690	1421	670	1367	650	1315	620
4[1]	HI	1996	960	1933	936	1868	910	1795	880	1722	845
	MED	1804	838	1765	810	1714	785	1650	765	1589	735
	LOW	1681	760	1640	738	1604	715	1541	695	1490	670
5[1]	HI	2400	1155	2338	1125	2274	1095	2167	1045	2096	1010
	MED	2290	1105	2214	1065	2145	1030	2071	990	1990	950
	LOW	2150	1020	2100	990	2029	950	1965	910	1905	880
6[1]	HI	2461	1480	2402	1440	2361	1395	2260	1350	2178	1305

UNIT TONNAGE)	MOTOR SPEED	AVAILABLE EXTERNAL STATIC PRESSURE-IWG[2]							
		0.70		0.80		0.90		1.00	
		CFM	WATTS	CFM	WATTS	CFM	WATTS	CFM	WATTS
3[1]	HI	1430	725	1360	700	1280	680	1180	655
	MED	1324	650	1260	630	1185	610	1100	590
	LOW	1246	605	1185	590	1110	570	1020	545
4[1]	HI	1635	820	1544	790	1419	765	1300	740
	MED	1508	705	1407	675	1306	645	1195	625
	LOW	1416	645	1337	620	1230	595	1120	575
5[1]	HI	1990	980	1887	945	1771	905	1629	855
	MED	1911	920	1828	885	1724	835	1604	798
	LOW	1816	838	1724	800	1644	770	1531	710
6[1]	HI	2101	1260	2000	1205	1914	1155	1830	1110

1. Side Duct application (230/460/575 Volts)
2. Includes allowances for a wet evaporator coil, 1" filters, and the heat exchangers. Refer to STATIC RESISTANCES Table for resistance values.

TABLE 25: BELT DRIVE BLOWER MOTOR AND DRIVE DATA

MODEL SIZE	BLOWER RANGE (RPM)	MOTOR[1]		ADJUSTABLE MOTOR PULLEY				FIXED BLOWER PULLEY				BELT (NOTCHED)		
		HP	FRAME	DESIG-NATION	OUTSIDE DIA. (IN.)	PITCH DIA. (IN.)	BORE (IN.)	DESIG-NATION	OUTSIDE DIA. (IN.)	PITCH DIA. (IN.)	BORE (IN.)	DESIG-NATION	PITCH LENGTH (IN.)	QTY.
3 TON	790/1120	1 1/2	56	1VL40	2.7-3.7	2.4-3.4	5/8	AK61	5.9	5.7	1	A36	37.3	1
4 TON	790/1120	1 1/2	56	1VL40	2.7-3.7	2.4-3.4	5/8	AK61	5.9	5.7	1	A36	37.3	1
5 TON	850/1220	1 1/2	56	1VL40	2.7-3.7	2.4-3.4	5/8	AK56	5.4	5.2	1	A36	37.3	1
6 TON	900/1250	1 1/2	56	1VL44	3.1-4.1	2.8-3.8	7/8	AK56	5.4	5.2	1	A36	37.3	1

1. All motors have solid bases and are inherently protected. these motors can be selected to operate into their service factor because they are located in the moving air, upstream of any heating device.

TABLE 26: STATIC RESISTANCES

DESCRIPTION		RESISTANCE, IWG CFM										
		1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000
ECONOMIZER[1 3]		0.07	0.08	0.09	0.11	0.13	0.15	0.17	0.20	0.23	0.26	0.30
ELECTRIC HEATERS[1]	7-15KW	0.04	0.05	0.06	0.07	0.08	0.10	0.12	0.14	0.16	0.19	0.22
	20-30KW	0.06	0.07	0.08	0.09	0.11	0.13	0.15	0.17	0.20	0.23	0.26
BOTTOM DUCT CONNECTIONS[1]		0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.14	0.16	0.19	0.22
COOLING ONLY[2]		0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.23	0.26	0.29	0.32

1. Deduct these resistance values from the available external static pressure shown in SUPPLY AIR BLOWER PERFORMANCE Tables.
2. Add these resistance values to the available static resistance values on SUPPLY AIR BLOWER PERFORMANCE Tables.
3. The pressure through the economizer is greater for 100% outdoor air than for 100% return air. If the resistance of the return air duct system is less than 0.25 IWG, the unit will deliver less CFM during full economizer operation.

PHASING

Check for proper compressor rotation. If the blower or compressors rotate in the wrong direction at start-up, the electrical connection to the unit is misphased. Change the incoming line connection phasing to obtain proper rotation. (Scroll compressors operate in only one direction. If the scroll is drawing low amperage, has similar suction and discharge pressures, or producing a high noise level, the scroll is misphased).

⚠ CAUTION

Scroll compressors require proper rotation to operate correctly. Do not change the internal wiring to make the blower, condenser fans, or compressor rotate correctly. Change the incoming power to the main terminal block to obtain proper rotation.

SUPPLY AIR BLOWERS

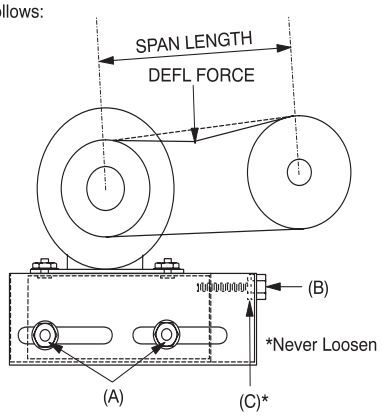
These blowers have either 3-speed direct drive motors, or single speed motors equipped with a belt drive. Belt drive units have a variable pitch pulley that allows the blower speed to be adjusted.

CHECKING SUPPLY AIR CFM

The RPM of the supply air blower will depend on the required CFM, the unit accessories or options and the static resistances of both the supply and the return air duct systems. With this information, the motor speed tap (direct drive) or the motor pulley number of turns open (belt drive) can be determined from the Blower Performance Data Tables.

PROCEDURE FOR ADJUSTING BELT TENSION:

1. Loosen nuts (A) (top and bottom).
2. Adjust the tension by turning bolt (B).
3. Never loosen nuts (C) from each other.
4. Use a belt tension checker to apply a perpendicular force to be one belt at the midpoint of the span as shown. The deflection force should be applied until a specific deflection distance of 4mm (5/32") is obtained. To determine the deflection distance from normal position, use a straight edge from sheave to sheave as a reference line. The recommended deflection force is as follows:



Tension new belts at the max. deflection force recommended for the belt section. Check the belt tension at least two times during the first 24 hours of operation. Any re-tensioning should fall between the min. and max. deflection force values.

5. After adjusting, re-tighten nuts (A).

FIGURE 16 - BELT ADJUSTMENT

Note the following:

1. The supply air CFM must be within the limitations shown in the Unit Application Data Table 1.
2. Pulleys can be adjusted in half turn increments.
3. The tension on the belt should be adjusted as shown in the Belt Adjustment Figure 16.

Start the supply air blower motor. Adjust the resistances in both the supply and the return air duct systems to balance the air distribution throughout the conditioned space. The job specifications may require that this balancing be done by someone other than the equipment installer.

To check the supply air CFM after the initial balancing has been completed:

1. Remove the two 5/16” dot plugs from the blower motor and the filter access panels shown in Figure 15.
2. Insert at least 8" of 1/4 inch tubing into each of these holes for sufficient penetration into the air flow on both sides of the indoor coil.

NOTE: The tubes must be inserted and held in a position perpendicular to the air flow so that velocity pressure will not affect the static pressure readings.

3. Using an inclined manometer, determine the pressure drop across a dry evaporator coil. Since the moisture on an evaporator coil may vary greatly, measuring the pressure drop across a wet coil under field conditions would be inaccurate. To assure a dry coil, the compressors should be deactivated while the test is being run.
4. Knowing the pressure drop across a dry coil, the actual CFM through the unit can be determined from the curve in Pressure Drop vs. Supply Air CFM (Figure 17).

⚠WARNING

Failure to properly adjust the total system air quantity and static pressure can result in extensive system damage.

After readings have been obtained, remove the tubes and reinstall the two 5/16” dot plugs that were removed in Step 1.

NOTE: De-energize the compressors before taking any test measurements to assure a dry indoor coil.

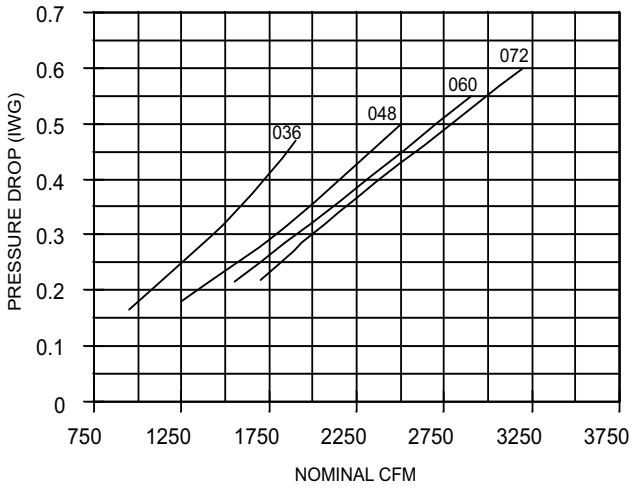


FIGURE 17 - PRESSURE DROP ACROSS COIL

OPERATION

SEQUENCE OF OPERATIONS OVERVIEW

For these units, the thermostat makes a circuit between “R” and “Y1” for the cooling cycle.

The call is passed to the unit control board (UCB), which then determines whether the requested operation is available and, if so, which components to energize.

For gas heating, the UCB monitors the “W1” call but does not handle the operation of the gas furnace. An ignition control board controls the gas heater operation.

For electric heat units, the UCB passes the call to the electric heater.

In both cases, when the “W1” call is sensed, the indoor air blower is energized following a specified heating delay.

If at any time a call for both heating and cooling are present, the heating operation will be performed. If operating, the cooling system is halted as with a completion of a call for cooling. Heating always takes priority.

COOLING SEQUENCE OF OPERATION

CONTINUOUS BLOWER

By setting the room thermostat fan switch to “ON,” the supply air blower will operate continuously.

INTERMITTENT BLOWER

With the room thermostat fan switch set to “AUTO” and the system switch set to either the “AUTO” or “HEAT” settings, the blower is energized whenever a cooling or heating operation is requested. The blower is energized after any specified delay associated with the operation.

When energized, the indoor blower has a minimum run time of 30 seconds. Additionally, the indoor blower has a delay of 10 seconds between operations.

NO OUTDOOR AIR OPTIONS

When the thermostat calls for cooling, the low-voltage control circuit from “R” to “Y1” and “G” is completed. The compressor and condenser fan motor are energized. After completing the specified fan on delay for cooling, the UCB will energize the blower motor.

Once the thermostat has been satisfied, it will de-energize Y1. If the compressor has satisfied its minimum run time, the compressor and condenser fan de-energize. Otherwise, the unit operates the cooling system until the minimum run time for the compressor has been completed. After the compressor de-energizes, the blower is stopped following the elapse of the fan off delay for cooling.

To be available, a compressor must not be locked-out due to a high or low-pressure switch or freezestat trip and the anti-short cycle delay (ASCD) must have elapsed.

ECONOMIZER WITH SINGLE ENTHALPY SENSOR

When the room thermostat calls for cooling, the low voltage control circuit from “R” to “G” and “Y1” is completed. The UCB energizes the blower motor (if the fan switch on the room thermostat is set in the “AUTO” position) and drives the economizer dampers from fully closed to their minimum position. If the enthalpy of the outdoor air is below the setpoint of the enthalpy controller (previously determined), “Y1” energizes the economizer. The dampers will modulate to maintain a constant supply air temperature as monitored by the discharge air sensor. If the outdoor air enthalpy is above the setpoint, “Y1” energizes the compressor and condenser fan motor only.

Once the thermostat has been satisfied, it will de-energize “Y1”. If the compressor has satisfied its minimum run time, the compressor and condenser fan are de-energized. Otherwise, the unit operates the cooling system until the minimum run times for the compressor has been completed. After the compressor de-energizes, the blower is stopped following the elapse of the fan off delay for cooling, and the economizer damper goes to the closed position. If the unit is in continues fan operation the economizer damper goes to the min. position.

ECONOMIZER WITH DUAL ENTHALPY SENSORS

The operation with the dual enthalpy sensors is identical to the single sensor except that a second enthalpy sensor is mounted in the return air. This return air sensor allows the economizer to choose between outdoor air and return air, whichever has the lowest enthalpy value, to provide maximum operating efficiency.

ECONOMIZER (SINGLE OR DUAL) WITH POWER EXHAUST

This system operates as specified above with one addition. The power exhaust motor is energized 45 seconds after the actuator position exceeds the exhaust fan setpoint on the economizer control. When the power exhaust is operating, the second stage of mechanical cooling will not operate. As always, the “R” to “G” connection provides minimum position but does not provide power exhaust operation.

MOTORIZED OUTDOOR AIR DAMPERS

This system operation is the same as the units with no outdoor air options with one exception. When the “R” to “G” circuit is complete, the motorized damper drives open to a position set by the thumbnail on the damper motor. When the “R” to “G” circuit is opened, the damper spring returns fully closed.

COOLING OPERATION ERRORS

Each cooling system is monitored for operation outside of the intended parameters. Errors are handled as described below. All system errors override minimum run times for compressors.

HIGH-PRESSURE LIMIT SWITCH

During cooling operation, if a high-pressure limit switch opens, the UCB will de-energize the compressor, initiate the ASCD (Anti-short cycle delay), and, stop the condenser fan. If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the compressor.

Should a high-pressure switch open three times within two hours of operation, the UCB will lock-out the compressor and flash a code (see Table 32).

LOW-PRESSURE LIMIT SWITCH

The low-pressure limit switch is not monitored during the initial 30 seconds of a cooling system's operation. For the following 30 seconds, the UCB will monitor the low-pressure switch to ensure it closes. If the low-pressure switch fails to close after the 30-second monitoring phase, the UCB will de-energize the compressor, initiate the ASCD, and stop the condenser fan.

Once the low-pressure switch has been proven (closed during the 30-second monitor period described above), the UCB will monitor the low-pressure limit switch for any openings. If the low-pressure switch opens for greater than 5 seconds, the UCB will de-energize the compressor, initiate the ASCD, and stop the condenser fan.

If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the compressor.

Should a low-pressure switch open three times within one hour of operation, the UCB will lock-out the compressor and flash a code (Table 32).

FREEZESTAT

During cooling operation, if a freezestat opens, the UCB will de-energize the compressor, initiate the ASCD, and stop the condenser fan. If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the compressor.

Should a freezestat open three times within two hours of operation, the UCB will lock-out the compressor and flash a code (Table 32).

LOW AMBIENT COOLING

To determine when to operate in low ambient mode, the UCB has a pair of terminals connected to a temperature-activated switch set at 45ºF. When the low ambient switch is closed and the thermostat is calling for cooling, the UCB will operate in the low ambient mode.

Low ambient mode operates the compressors in this manner: 10 minutes on, 5 minutes off. The indoor blower is operated throughout the cycle. The 5-minute off period is necessary to defrost the indoor coil.

Low ambient mode always begins with compressor operation. Compressor minimum run time may extend the minutes of compressor operation. The defrost cycle will begin immediately following the elapse of the minimum run time.

When operating in low ambient mode, the UCB will not lockout the compressor due to a freezestat trip. However, a freezestat trip will de-energize the compressor. If the call for cooling is still present at the end of the ASCD and the freezestat has closed, the unit will resume operation.

SAFETY CONTROLS

The unit control board monitors the following inputs for the cooling system:

1. A suction line freezestat to protect against low evaporator temperatures due to a low airflow or a low return air temperature, (opens at 26 ± 5 °F and resets at 38 ± 5°F).

2. A high-pressure switch to protect against excessive discharge pressures due to a blocked condenser coil or a condenser motor failure, (opens at 380 ± 10 psig and resets at 300 ± 10 psig).

3. A low-pressure switch to protect against loss of refrigerant charge, (opens at 22 ± 5 psig and resets at 45 ± 5 psig).

The above pressure switches are hard-soldered to the unit. The refrigeration system is monitored and controlled. On any fault, the system will be affected by any safety/preventive action.

The unit control board monitors the temperature limit switch of electric heat units and the temperature limit switch and the gas valve of gas furnace units.

COMPRESSOR PROTECTION

The compressor also has inherent (internal) protection. If there is an abnormal temperature rise in a compres-

sor, the protector will open to shut down the compressor. The UCB incorporates features to minimize compressor wear and damage. An anti-short cycle delay (ASCD) is utilized to prevent operation of a compressor too soon after its previous run. Additionally, a minimum run time is imposed any time a compressor is energized.

The ASCD is initiated on unit start-up and on any compressor reset or lock-out.

FLASH CODES

The UCB will initiate a flash code associated with errors within the system. Refer to UNIT CONTROL BOARD FLASH CODES Table 32.

RESET

Remove the call for cooling, by raising thermostat setting higher than the conditioned space temperature. This resets any pressure or freezestat flash codes.

ELECTRIC HEATING SEQUENCE OF OPERATIONS

The following sequence describes the operation of the electric heat section.

Single-stage heating (applies only to 5, 7 & 10 kW 230V heaters and to 7, 10, & 15 kW 460V and 575V heaters. All other heaters MUST use a two-stage thermostat):

a. Upon a call for heat by the thermostat, the heater sequencer (1S) will be energized. After completing the specified fan on delay for heating, the UCB will energize the blower motor.

b. The thermostat will cycle the electric heat to satisfy the heating requirements of the conditioned space.

Two-stage heating (applies only to 15, 20 and 30 kW 230V heaters and 20 and 30 kW heater 460V and 575V heaters.):

a. Upon a call for first-stage heat by the thermostat, the heater sequencer (1S) (15, 20, 30 kW 230 volt) and contactor (2M) (20, 30 kW 460 and 575 volt) will be energized. After completing the specified fan on delay for heating, the UCB will energize the blower motor.

   If the second stage of heat is required, heater sequencer (2S) (12, 20, 30 kW 230 volt) or contactor (3M) (20, 30 kW 460 and 575 volt) will be energized. After completing the specified fan on delay for heating, the UCB will energize the blower motor.

b. The thermostat will cycle the electric heat to satisfy the heating requirements of the conditioned space.

SAFETY CONTROLS

The control circuit includes the following safety controls:

1. Temperature Limit Switch (TLS) - This control is located inside the heater compartment and is set to open at the temperature indicated in the Electric Heat Limit Control Setting Table 27. It resets automatically. The limit switch operates when a high temperature condition, caused by inadequate supply air flow occurs, thus shutting down the heater and energizing the blower.

TABLE 27: ELECTRIC HEAT LIMIT CONTROL SETTING

VOLTAGE	kW	TEMPERATURE LIMIT SWITCH	OPEN TEMP °F
230-3-60	5	1,2,3	140
	7	1,2,3	140
	10	1,2,3	150
	15	2,4,6	140
	20	1,2,3,4,5,6	150
	30	1,3,5	160
		2,4,6	150
460-3-60	7	2,4,6	140
	10	2,4,6	140
	15	2,4,6	140
	20	3	160
	30	3	160
575-3-60	10	2,4,6	140
	15	2,4,6	140
	20	5	160
	30	5	150

RESET

Remove the call for heating by lowering the thermostat setting lower than the conditioned space temperature. This resets any flash codes.

HEAT ANTICIPATOR SETPOINTS

It is important that the anticipator setpoint be correct. Too high of a setting will result in longer heat cycles and

a greater temperature swing in the conditioned space. Reducing the value below the correct setpoint will give shorter “ON” cycles and may result in the lowering of the temperature within the conditioned space. Refer to Table 28 for the required heat anticipator setting.

TABLE 28: ELECTRIC HEAT ANTICIPATOR SETPOINTS

HEATER KW	VOLTAGE	SETTING, AMPS	
		TH1	TH2
5	230-3-60	0.35	-
7		0.35	-
10		0.35	-
15		0.35	0.19
20		0.35	0.38
30		0.35	0.38
7	460-3-60	0.35	-
10		0.35	-
15		0.35	-
20		0.37	0.29
30		0.37	0.29
10	575-3-60	0.35	-
15		0.35	-
20		0.37	0.29
30		0.37	0.29

GAS HEATING SEQUENCE OF OPERATION

When there is a W1 call for heat, the heat relay (RW1) is energized by the unit control board (UCB). The RW1-1 contacts immediately close energizing the ignition control board (ICB). The ICB checks the state of the flame sense circuit, the roll out switch, the centrifugal switch and the primary / auxiliary temperature limit switch circuit. If they are in the expected state, then the ICB energizes the draft motor and verifies that the centrifugal switch located on the end of the draft motor closes. After the centrifugal switch closes, a 15 second heat exchanger purging period is completed. After this purging period, the ICB will simultaneously energize the pilot gas valve and the ignition coil. Once the flame sensor senses a pilot flame is present, the ignition coil is de-energized. The ICB checks for pilot flame stability and once the ICB is satisfied that the pilot flame is stable, the main gas valve is energized by the ICB. The UCB will energize the indoor blower after a 45 second delay from the call for heat. The ICB and UCB both monitor the furnace safety devices during the furnace operation. When the call for heat is satisfied, the ICB closes the pilot and main gas valves and performs a 30 second purging of the heat exchanger by continuing the operation of the draft motor. The UCB continues the operation of the indoor blower for a configurable amount of time after the call for heat is satisfied.

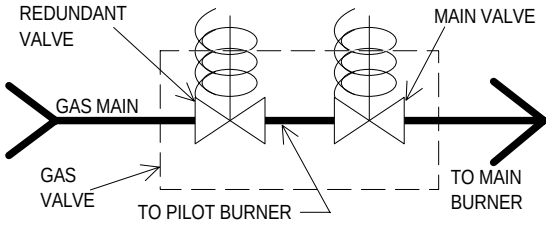


FIGURE 18 - GAS VALVE PIPING

GAS HEAT OPERATION ERRORS

During furnace operation, the ICB monitors the flame sense circuit, the centrifugal switch, the primary limit switch and the roll out switch. If a signal from any of the inputs moves to a fault state, then the ICB immediately closes the pilot and main gas valves. The ICB will determine the device that is signaling a fault and flash a code for that device. A primary limit trip, centrifugal switch trip or flame sense fault triggers a temporary lock out. An auxiliary limit or a roll out switch trip requires intervention to reset the ICB. The UCB also monitors the primary limit and gas valve.

TEMPERATURE LIMITS

The primary limit is located such that the temperature sensitive switch can sense the temperature of the heat exchanger tubes. On single stage models the limit is mounted to the condenser partition panel. On two stage models the limit is mounted just above the inlet of the heat exchanger tubes on the right side. If a primary limit (LS) fault occurs (the primary limit opens due to excessive heat exchanger temperature), then the ICB will flash the appropriate code (Table 33) and monitor the primary limit. The UCB will energize the indoor blower and the ICB will energize the draft motor while the primary limit is open. When the primary limit closes and the call for heat still exists, the ICB will start the ignition sequence over and the UCB will de-energize the blower for 45 seconds. However, the auxiliary limit is in series with the primary limit and it takes first control. If the excessive heat has been high enough to cause the auxiliary limit (AUX) to open, then the ICB will flash the primary limit code but the furnace will not retry ignition during the same call for heat. The auxil-

iary limit is of the manual reset type and is mounted in the upper right hand corner of the panel between the burner manifold and the flue gas collector box just behind the draft motor. If the auxiliary switch has opened, then special attention should be paid to the primary limit as it may be faulty as well. However, the auxiliary switch is sized such that multiple trips of the primary limit due to complete blower failure will cause enough heat to build up and trip the auxiliary.

If the primary limit opens three times within one hour, then the UCB will lock on the indoor blower and flash a fault code (Table 32).

GAS VALVE

The UCB monitors the gas valve (GV). Any time the UCB senses voltage at the GV without a call for heat for a continuous five-minute period, the UCB will lock on the indoor blower and a flash code on the UCB is initiated (Table 32). When the UCB no longer senses voltage at the GV the UCB will de-energize the indoor blower after the expiration of the indoor blower heating off delay.

If the voltage has been sensed at the GV for at least 15 seconds during the fan on delay for heating and the UCB no longer senses voltage at the GV (W1 call for heat removed or an ICB fault exists), then the UCB forces the indoor blower on for the indoor blower heating off delay.

The gas valve is of the redundant type. If for any reason the main gas valve fails in the open position, then the redundant valve ahead of the main gas valve will shut off the flow of gas to both the pilot and main gas valves.

CENTRIFUGAL SWITCH

The centrifugal switch is mounted on the end of the draft motor and it is an integral part of the motor assembly. On a call for heat, the ICB checks the centrifugal switch (CS) for open state before it energizes the draft motor. If it is closed, then the ICB will lock out the furnace and flash a code (Table 33). If open, then the ICB will energize the draft motor and verify that the switch closes before initiating the purging and ignition sequence. If at any time during furnace operation the centrifugal switch opens, then the ICB will de-energize the pilot and main gas valves and monitor the centrifugal switch. If the centrifugal switch closes and the call for heat still exists, then the ICB will retry the purging and ignition sequence.

ROLLOUT SWITCH

This temperature sensitive switch is located in the burner vestibule just above the right hand side of the burner assembly. In the event of the flame spilling out into the burner manifold area the rollout switch will open, the ICB will close both the main and pilot gas valves and flash a code (Table 33). The ICB will not retry the ignition sequence during the same call for heat.

FLAME SENSE CIRCUIT

The flame sensor is mounted on the left hand side of the burner assembly and is positioned such that the pilot flame surrounds the tip of the sensor. On a call for heat the ICB checks for the flame sense circuit to be open. If open, then the ICB initiates the purging and ignition sequence. Once the pilot flame is present, the ICB monitors the flame sense circuit for pilot flame stability. If the pilot flame is unstable or lost completely, then the ICB will immediately close both the pilot and main gas valves. The ICB will retry the purging and ignition sequence. If the flame is unstable or lost more than 16 times during the same call for heat, then the ICB will lock out furnace operation for 5 minutes.

TABLE 29: SINGLE STAGE GAS HEAT LIMIT CONTROL SETTING

Units (Tons)	Capacity, MBH		Limit Control Opens, ºF
	Input	Output	
3	50	40	165
4	75	60	165
3	100	80	165
4	125	100	165
5	100	80	165
5	125	100	165
6	100	80	165
6	125	100	165

FLASH CODES

The UCB will initiate a flash code associated with errors within the system. Refer to UNIT CONTROL BOARD FLASH CODES Table 32.

RESETS

Remove the call for heating by lowering the thermostat setting lower than the conditioned space temperature. This resets any flash codes.

HEAT ANTICIPATOR SETPOINTS

It is important that the anticipator setpoint be correct. Too high of a setting will result in longer heat cycles and a greater temperature swing in the conditioned space. Reducing the value below the correct setpoint will give shorter “ON” cycles and may result in the lowering of the temperature within the conditioned space.

TABLE 30: GAS HEAT ANTICIPATOR SETPOINTS

Gas Valve	Anticipator Setpoint
Honeywell VR8204M	0.60 amp
White-Rodgers 36E36	0.54 amp

START-UP (COOLING)

PRESTART CHECK LIST

After installation has been completed:

1. Check the electrical supply voltage being supplied. Be sure that it is the same as listed on the unit nameplate.
2. Set the room thermostat to the off position.
3. Turn unit electrical power on.
4. Set the room thermostat fan switch to on.
5. Check indoor blower rotation.
    - If blower rotation is in the wrong direction. Refer to Phasing Section in general information section.
    - Check blower drive belt tension.
6. Check the unit supply air (CFM). See “CHECKING SUPPLY AIR CFM” on page 38.
7. Measure evaporator fan motor's amp draw.
8. Set the room thermostat fan switch to off.
9. Turn unit electrical power off.

OPERATING INSTRUCTIONS

1. Turn unit electrical power on.
2. Set the room thermostat setting to lower than the room temperature.
3. First stage compressors will energize after the built-in time delay (five minutes).
4. The second stage of the thermostat will energize second stage compressor if needed.

POST START CHECK LIST

1. Verify proper system pressures for both circuits.
2. Measure the temperature drop across the evaporator coil.
3. Measure the system Amperage draw across all legs of 3 phase power wires.
4. Measure the condenser fan amp draw.

SHUT DOWN

1. Set the thermostat to highest temperature setting.
2. Turn off the electrical power to the unit.

START-UP (GAS HEAT)

PRE-START CHECK LIST

Complete the following checks before starting the unit.

1. Check the type of gas being supplied. Be sure that it is the same as listed on the unit nameplate.
2. Make sure that the vent and combustion air hoods have been properly installed.

OPERATING INSTRUCTIONS

⚠ CAUTION

This furnace is equipped with an intermittent pilot and automatic re-ignition system. DO NOT attempt to manually light the pilot.

TO LIGHT PILOT AND MAIN BURNERS:

1. Turn “off” electric power to unit.

2. Turn room thermostat to lowest setting.

3. Turn gas valve knob or switch to “on” position.

4. Turn “on” electric power to unit.

5. Set room thermostat to desired temperature. (If thermostat “set” temperature is above room temperature, pilot burner ignition will occur and, after an interval to prove pilot flame, main burners will ignite).

TO SHUT DOWN:

1. Turn “off” electric power to unit.

2. Depress knob of gas valve while turning to “off” position or position the switch to the “off” position.

POST-START CHECK LIST (GAS)

After the entire control circuit has been energized and the heating section is operating, make the following checks:

1. Check for gas leaks in the unit piping as well as the supply piping.

⚠WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death or property damage.

Never test for gas leaks with an open flame. use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

2. Check for correct manifold gas pressures. See “Checking Gas Input” on page 47.

3. Check the supply gas pressure. It must be within the limits shown on rating nameplate. Supply pressure should be checked with all gas appliances in the building at full fire. At no time should the standby gas line pressure exceed 13", nor the operating pressure drop below 5.0" for natural gas units. If gas pressure is outside these limits, contact the local gas utility for corrective action.

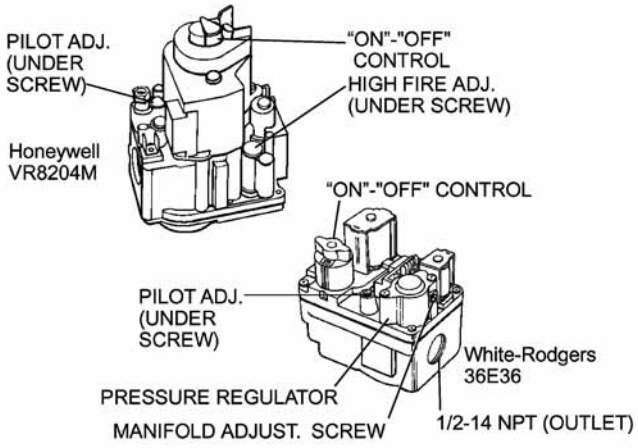


FIGURE 19 - TYPICAL SINGLE STAGE GAS VALVES

MANIFOLD GAS PRESSURE ADJUSTMENT

Adjustments to gas flow may be made by turning the pressure regulator adjusting screws on the automatic gas valve.

Adjust as follows:

1. Remove the adjustment screw cap(s) on the regulator.
2. To decrease the gas pressure, turn the adjusting screw counterclockwise.
3. To increase the gas pressure, turn the adjusting screw clockwise.
4. Replace adjustment screw caps.

NOTE: The factory set high-fire manifold pressure for these furnaces is 3.50 IWG. The actual manifold pressure depends on the local fuel heating value.

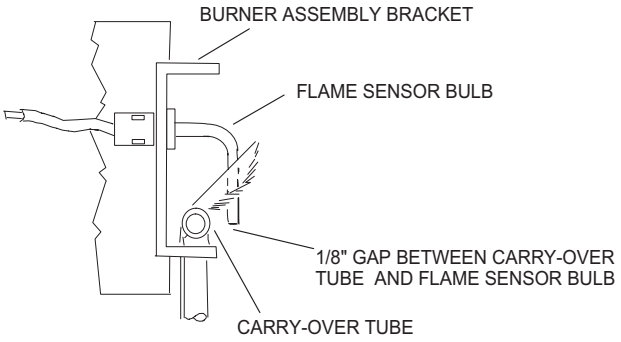


FIGURE 20 - PROPER FLAME ADJUSTMENT

PILOT CHECKOUT

The pilot flame should envelope the end of the flame sensor. To adjust pilot flame, (1) remove pilot adjustment cover screw, (2) increase or decrease the clearance for air to the desired level, (3) be sure to replace cover screw after adjustment to prevent possible gas leakage.

Put the system into operation and observe through complete cycle to be sure all controls function properly.

BURNER INSTRUCTIONS

To check or change burners, pilot or orifices, CLOSE MAIN MANUAL SHUT-OFF VALVE AND SHUT OFF ALL ELECTRIC POWER TO THE UNIT.

1. Remove the screws holding either end of the manifold to the burner supports.
2. Open the union fitting in the gas supply line just upstream of the unit gas valve and downstream from the main manual shut-off valve.
3. Remove the gas piping closure panel.
4. Disconnect wiring to the gas valves and spark ignitors. Remove the manifold-burner gas valve assembly by lifting up and pulling back.

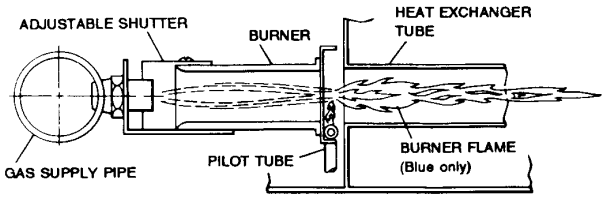


FIGURE 21 - TYPICAL FLAME APPEARANCE

Burners are now accessible for service.

Reverse the above procedure to replace the assemblies. Make sure that burners are level and seat at the rear of the heat exchanger.

BURNER AIR SHUTTER ADJUSTMENT

Adjust burner shutters so no yellow flame is observed in the heat exchanger tubes.

CHECKING GAS INPUT

NATURAL GAS

1. Turn off all other gas appliances connected to the gas meter.
2. With the furnace turned on, measure the time needed for one revolution of the hand on the smallest dial on the meter. A typical gas meter usually has a 1/2 or a 1 cubic foot test dial.
3. Using the number of seconds for each revolution and the size of the test dial increment, find the cubic feet of gas consumed per hour from the Gas Rate - Cubic Feet Per Hour (Table 31).

If the actual input is not within 5% of the furnace rating (with allowance being made for the permissible range of the regulator setting), replace the orifice spuds with spuds of the proper size.

NOTE: To find the Btu input, multiply the number of cubic feet of gas consumed per hour by the Btu content of the gas in your particular locality (contact your gas company for this information - it varies widely from city to city.)

TABLE 31: GAS RATE - CUBIC FEET PER HOUR[1]

Seconds for one rev.	Size of Test Dial	
	1/2 cu. ft.	1 cu. ft.
10	180	360
12	150	300
14	129	257
16	113	225
18	100	200
20	90	180
22	82	164
24	75	150
26	69	138
28	64	129
30	60	120
32	56	113
34	53	106
36	50	100
38	47	95
40	45	90
42	43	86
44	41	82
46	39	78
48	37	75
50	36	72
52	35	69
54	34	67
56	32	64
58	31	62
60	30	60

1. By actual measurement, it takes 38 seconds for the hand on the 1-cubic foot dial to make a revolution with a 100,000 Btuh furnace running. Using this information, located 38 seconds in the first column in the table above. Read across to the column headed “1 Cubic Foot”, where you will see that 95 cubic feet of gas per hour are consumed by the furnace at that rate. Multiply 95 X 1050 (the Btu rating of the gas obtained from the local gas company). The result is 99,750 Btuh, which is close to the 100,000 Btuh rating of the furnace.

ADJUSTMENT OF TEMPERATURE RISE

The temperature rise (or temperature difference between the return air and the heated air from the furnace) must lie within the range shown on the rating plate and the data in the Gas Heat Application Table 4.

$$CFM = \frac{\text{Btuh Input x } 0.8}{108 \times {}^{o}F \text{ Temp. Rise}}$$

After the temperature rise has been determined, the cfm can be calculated as follows:

After about 20 minutes of operation, determine the furnace temperature rise. Take readings of both the return air and the heated air in the ducts (about six feet from the furnace) where they will not be affected by radiant heat. Increase the blower cfm to decrease the temperature rise; decrease the blower cfm to increase the rise. Refer to the Blower Motor and Drive Data Table 25.

TROUBLESHOOTING

COOLING TROUBLESHOOTING GUIDE

⚠WARNING

Troubleshooting of components may require opening the electrical control box with the power connected to the unit. **Use extreme care when working with live circuits!** Check the unit nameplate for the correct line voltage and set the voltmeter to the correct range before making any connections with line terminals.

Shut off all electric power to the unit prior to any of the following maintenance procedures to prevent personal injury.

⚠ CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation, which could cause injury to person and/or damage unit components. Verify proper operation after servicing.

On calls for cooling, if the compressors are operating but the supply air blower motor does not energize after a short delay (the room thermostat fan switch is in the “AUTO” position).

1. Turn the thermostat fan switch to the ON position. If the supply air blower motor does not energize, go to Step 3.

2. If the blower motor runs with the fan switch in the ON position but will not run after the compressor has energized when the fan switch is in the AUTO position, check the room thermostat for contact between R and G in the AUTO position during calls for cooling.
3. If the supply air blower motor does not energize when the fan switch is set to ON, check that line voltage is being supplied to the contacts of the M2, contactor, and that the contactor is pulled in. Check for loose wiring between the contactor and the supply air blower motor.
4. If M2 is pulled in and voltage is supplied to M2, lightly touch the supply air blower motor housing. If it is hot, the motor may be off on internal protection. Cancel any thermostat calls and set the fan switch to AUTO. Wait for the internal overload to reset. Test again when cool.
5. If M2 is not pulled in, check for 24 volts at the M2 coil. If 24 volts are present at M2 but M2 is not pulled in, replace the contactor.
6. Failing the above, if there is line voltage supplied at M2, M2 is pulled in, and the supply air blower motor still does not operate, replace the motor.
7. If 24 volts is not present at M2, check that 24 volts is present at the UCB supply air blower motor terminal, “FAN”. If 24 volts is present at the FAN, check for loose wiring between the UCB and M2.
8. If 24 volts is not present at the “FAN” terminal, check for 24 volts from the room thermostat. If 24 volts are not present from the room thermostat, check for the following:
    a. Proper operation of the room thermostat (contact between R and G with the fan switch in the ON position and in the AUTO position during operation calls).
    b. Proper wiring between the room thermostat and the UCB.
    c. Loose wiring from the room thermostat to the UCB.
9. If 24 volts is present at the room thermostat but not at the UCB, check for proper wiring between the thermostat and the UCB, i.e. that the thermostat G terminal is connected to the G terminal of the UCB, and for loose wiring.
10. If the thermostat and UCB are properly wired, replace the UCB.

On a call for cooling, the supply air blower motor is operating but the compressor is not (the room thermostat fan switch is in the “AUTO” position).

1. If installed, check the position of the economizer blades. If the blades are open, the economizer is providing free cooling and the compressors will not immediately operate. If both stages of cooling are requested simultaneously and the economizer provides free cooling, following a short delay the compressor will be energized unless it is locked out, unless this option has been disabled through computer communications.
2. If no economizer is installed or the economizer is not opening to provide free cooling and the compressor does not energize on a call for cooling, check for line voltage at the compressor contactor, M1, and that the contactor is pulled in. Check for loose wiring between the contactor and the compressor.
3. If M1 is pulled in and voltage is supplied at M1, lightly touch the compressor housing. If it is hot, the compressor may be off on inherent protection. Cancel any calls for cooling and wait for the internal overload to reset. Test again when cool.
4. If M1 is not pulled in, check for 24 volts at the M1 coil. If 24 volts are present and M1 is not pulled in, replace the contactor.
5. Failing the above, if voltage is supplied at M1, M1 is pulled in, and the compressor still does not operate, replace the compressor.
6. If 24 volts is not present at M1, check for 24 volts at the UCB terminal, C1. If 24 volts is present, check for loose wiring between C1 and the compressor contactor.
7. If 24 volts is not present at the C1 terminal, check for 24 volts from the room thermostat at the UCB Y1 terminal. If 24 volts is not present from the room thermostat, check for the following:
    a. 24 volts at the thermostat Y1 terminal
    b. Proper wiring between the room thermostat and the UCB, i.e. Y1 to Y1, Y2 to Y2
    c. Loose wiring from the room thermostat to the UCB.
8. If 24 volts is present at the UCB Y1 terminal, the compressor may be out due to an open high-pressure switch, low-pressure switch, or freezestat.

Check for 24 volts at the HPS1, LPS1, and FS1 terminals of the UCB. If a switch has opened, there should be a voltage potential between the UCB terminals, e.g. if LPS1 has opened, there will be a 24-volt potential between the LPS1 terminals.

9. If 24 volts is present at the UCB Y1 terminal and none of the protection switches have opened, the UCB may have locked out the compressor for repeat trips. The UCB should be flashing an alarm code. If not, press and release the ALARMS button on the UCB. The UCB will flash the last five alarms on the LED. If the compressor is locked out, cancel any call for cooling. This will reset any compressor lock outs.

NOTE: While the above step will reset any lockouts, the compressor may be held off for the ASCD. See the next step.

10. If 24 volts is present at the UCB Y1 terminal and none of the switches are open and the compressor is not locked out, the UCB may have the compressor in an ASCD. Check the LED for an indication of an ASCD cycle. The ASCD should time out within 5 minutes. Press and release the TEST button to reset all ASCDs.

11. If 24 volts is present at the UCB Y1 terminal and the compressor is not out due to a protective switch trip, repeat trip lock out, or ASCD, the economizer terminals of the UCB may be improperly wired. Check for 24 volts at the Y1 “OUT” terminal of the UCB. If 24 volts is present, trace the wiring from Y1 “OUT” for incorrect wiring. If 24 volts is not present at the Y1 “OUT” terminal, the UCB must be replaced.

12. *For units without economizers*: If 24 volts is present at the Y1 OUT terminal, check for 24 volts at the Y1 “ECON” terminal. If 24 volts is not present, check for loose wiring from the Y1 “OUT” terminal to the Mate-N-Lock plug, the jumper in the Mate-N-Lock plug, and in the wiring from the Mate-N-Lock plug to the Y1 “ECON” terminal.

13. *For units with economizers*: If 24 volts is present at the Y1 “OUT” terminal, check for 24 volts at the Y1 “ECON” terminal. If 24 volts is not present, check for loose wiring from the Y1 “OUT” terminal to the Mate-N-Lock plug, a poor connection between the UCB and economizer Mate-N-Lock plugs, loose wiring from the Mate-N-Lock plug to the economizer, back to the Mate-N-Lock plug, and from the Mate-N-Lock plug to the Y1 “ECON” terminal. If nothing is found, the economizer actuator may have faulted and is failing to return the 24-volt “call” to the Y1 “ECON” terminal even though the economizer is not providing free cooling. To test, disconnect the Mate-N-Locks and jumper between the WHITE and YELLOW wires of the UCB’s Mate-N-Lock plug. If the compressor energizes, there is a fault in the economizer wiring or actuator.

14. The UCB can be programmed to lock out compressor operation during free cooling and in low ambient conditions. These options are not enabled by default. Local distributors can test the UCB for this programming.

    For units with factory installed economizers, the UCB is programmed to lock out compressor operation when the LAS set point is reached.

    For units without factory installed or with field installed economizers, the UCB allows compressor operation all the time. This programming can be checked or changed by the local distributor.

15. If none of the above correct the error, replace the UCB.

GAS HEAT TROUBLESHOOTING GUIDE

⚠WARNING

Troubleshooting of components may require opening the electrical control box with the power connected to the unit. **Use extreme care when working with live circuits!** Check the unit nameplate for the correct line voltage and set the voltmeter to the correct range before making any connections with line terminals.

When not necessary, shut off all electric power to the unit prior to any of the following maintenance procedures so as to prevent personal injury.

⚠ CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation, which could cause injury to person and/or damage unit components. Verify proper operation after servicing.

⚠WARNING

The furnace may shut down on a high temperature condition during the procedure. If this occurs, the UCB energize the supply air blower motor until the high temperature limit has reset. Caution should be used at all times as the supply air blower may energize regardless of the room thermostat fan switch position.

Before beginning symptomatic troubleshooting activities read the flash code LEDs on the unit control board (UCB) and the ignition control board (ICB). Fault codes have a quick sequence of flashes indicating the flash code number followed by a pause with the LED off. The ICB flash codes are repeated until the fault is cleared. The ICB monitors itself, the centrifugal switch, lockout due to > 16 pilot flame losses, primary limit, rollout and a flame present when the ICB expects no flame.

With power applied to the unit, if the LED on the ICB is flashing the heartbeat and the furnace will not operate, then proceed to the symptomatic troubleshooting section. If the ICB LED is not flashing, then perform the ICB troubleshooting procedures. If the ICB has a flash code other than the heartbeat, then determine the flash code and locate its troubleshooting procedures in the flash code troubleshooting section. Refer to Table 33 for flash code identification and component causing fault.

FLASH CODE TROUBLESHOOTING

Power to the unit should be interrupted during the troubleshooting of individual components unless otherwise indicated. All troubleshooting procedures assume the unit is wired per the wiring diagram. If there is any indication the unit has been previously repaired, then the first priority is to verify that the furnace is wired per the wiring diagram. Miss-wired units will give false flash codes.

IGNITION CONTROL BOARD

The ICB controls the ignition of the pilot, the opening and closing of the gas valves and the operation of the draft (inducer) motor. It also monitors all the furnace safety components.

If the ICB LED is on steady, then verify the wiring of the unit to the wiring diagram and if ok, then replace the ICB. If the unit has power and the ICB LED is not flashing, then remove the 3 pin connector from the ICB. Measure the control voltage between terminals 1 and 2 of the wiring harness connector. The control voltage must be between 18 and 30 volts. If control voltage is not present, then check the 3.2A circuit breaker to verify that the circuit breaker has control voltage on both input and output terminals. If control voltage is present on the input and not the output of the circuit breaker, then reset or replace the circuit breaker as necessary. If control voltage is present on both sides of the circuit breaker, then check the power and common wires between the unit control box and the ICB and repair as necessary. If the control voltage is present, then verify the cleanliness of the harness and the ICB connector, clean if necessary and reconnect the wiring harness to the ICB and observe ICB LED. If it now flashes the heartbeat, then the fault was a bad connection between the harness connector and the ICB connector or a broken wire exists in the harness. With the harness connected to the ICB, gently move the wires in the harness while observing the ICB LED. If heartbeat is steady, then verify proper operation of the furnace. If the ICB does not flash the heartbeat, then gently move the wires in the harness connector while observing the ICB LED. If you get any flashes of the ICB LED, then there is still a bad connection or a broken wire. If no flashes are seen while gently moving the wires with the harness connected to the ICB, then replace the ICB and verify proper operation of the furnace.

CENTRIFUGAL SWITCH

The centrifugal switch is an integral part of the draft motor. The centrifugal switch closes when the motor speed increases to ~2500 rpm and opens when the motor speed descends to ~2000 rpm.

If a flash code indicates the centrifugal switch is causing a fault, then

1. If the flash code indicates the switch is open with the draft (inducer) motor on (flash code 2), then
   a. Disconnect power to the unit. Using a screw driver, spin the draft motor blower wheel. If bound or dragging, then visually inspect the draft motor blower

wheel area for debris. If debris is present, then clear debris and verify proper furnace operation. If clear, then replace the draft motor and verify proper furnace operation.

b. Restore power to unit and induce a call for heat. Measure the voltage across the two draft motor leads (white and red). If it is less than 177 volts, then check and repair the power circuit to the draft motor. If the voltage is greater than 176 volts and the draft motor is not turning, then disconnect power and draft motor power leads. Measure the resistance of the draft motor windings. If an open circuit exists in the motor, then replace the draft motor. If the voltage is greater than 176 volts and the motor is turning, then check the centrifugal switch wiring between the ICB and the draft motor. If ok, then disconnect power to the unit and place the gas valve in the off position. Prepare to temporarily jumper the wires connected to terminals 3 and 8 of the ICB 9 pin harness connector by disconnecting the draft motor leads from the 9 pin harness. Restore the power to the unit and induce a call for heat. Jumper wires 3 and 8. If the ignition sequence is started after 15 seconds (audible sparking of the igniter), then replace the draft motor reconnecting the centrifugal switch wiring per the wiring diagram. If not, then replace the ICB, remove the jumper and reconnect the centrifugal switch wiring per the wiring diagram. Place the gas valve in the on position and verify proper furnace operation.

2. If the flash code indicates the switch is closed with the draft (inducer) motor off (flash code 3), then disconnect the 9 pin connector from the ICB and measure the continuity of the centrifugal switch with a battery powered test light or an ohm meter between terminals 3 and 8 of the harness connector. If a closed circuit is indicated, then check the wiring between the ICB and the draft motor. If the wiring is not shorted together, then replace the draft motor. If an open circuit is indicated, then reconnect the 9 pin wiring harness to the ICB and remove power to the unit for at least 20 seconds. Restore power to the unit. If the ICB continues to flash a code 3, then replace the ICB.

PILOT FLAME LOCKOUT

The ICB counts the number of flame losses during the same call for heat. If more than 16 flame losses occur within the same call for heat, then the control temporarily locks out furnace operation for 5 minutes (flash code 5). If the call for heat remains after the 5 minutes, then the ICB will retry the ignition sequence. The flame losses can be due to low inlet pressure, debris around flame sensor, plugged pilot burner, soot on the surface of the flame sensor or misadjusted pilot pressure. Remove the power to the unit for 20 seconds and then restore power to the unit. Induce a call for heat and observe the pilot flame in the flame sensor area to determine the best course of action.

1. If the flame is strong and stable in the flame sensor area, then verify the position of the flame sensor per the start up procedures. If ok, then remove the flame sensor and check the cleanliness of the electrode. If clean, then replace the flame sensor and adjust pilot per the start up procedures. If not clean, then clean, reinstall and adjust pilot per the start up procedures.

2. If the flame is weak or unstable in the flame sensor area, then verify the gas inlet pressure. If gas inlet pressure is above the minimum inlet pressure stated on unit data label, then adjust the pilot pressure per the start up procedures. If the pilot cannot be adjusted to obtain a strong and stable flame in the flame sensor area, then remove the burner assembly and verify the pilot burner assembly is open internally and the holes in the burner are clean. Check the pilot orifice size to the unit data plate and the cleanliness of the pilot orifice. Verify that the flame sensor electrode is clean and is adjusted properly. After cleaning or replacement of the pilot assembly components, reinstall the burner assembly and adjust pilot per the start up procedure.

PRIMARY OR AUX TEMPERATURE LIMIT

The temperature limits limit the temperature in the furnace to a safe level. If a temperature higher than the preset limit is achieved due to low or no air flow through the furnace, then the temperature limits opens and the ICB closes the gas valve and flashes code 6. The primary limit is automatic reset type while the auxiliary limit is manual reset type. If either one opens, then the ICB removes power to the gas valve and the UCB energizes the indoor blower until the primary limit automatically resets or the auxiliary limit is manually reset. Verify adequate air flow through the furnace. If air flow is nonexistent or weak, then troubleshoot and repair the conditioned space air circulation system as necessary. Reset the auxiliary limit and verify proper operation of the furnace. If airflow is normal, then verify the gas input rate to the furnace following the start up procedures (auxiliary limit must be reset before the furnace will operate). If after verifying the circulating air system, the input rate to the furnace and that the air temperature rise through the furnace is within the rise range on the unit data plate the flash code still exists,

then set the gas valve to the off position and temporarily apply control voltage (~24 volts) to pin 9 of the 9 pin ICB connector. With power applied to the unit, if the ICB LED continues to flash a code 6, then replace the ICB and return unit to operation (you must remove the temporary voltage to pin 9 before the gas valve is turned on). If the ICB LED flashes a heartbeat, then replace the limit that is opening, remove the temporary voltage applied to pin 9, turn on the gas valve, restart the furnace and verify proper operation of the furnace.

ROLLOUT SWITCH

The rollout switch is installed to protect the furnace from damage due to excessive heat in the burner area. There are 4 main reasons the rollout switch will open (flash code 7) due to excessive heat in the burner area. You must remove power to the unit for 20 seconds to reset the ICB.

1. A blocked flue outlet is the most common cause for the rollout switch to open. Check the flue outlet for debris and clear if necessary.

2. Loose blower wheel on draft motor. Verify that the blower wheel is securely fastened to the draft motor shaft.

3. Unit operating outside the air temperature rise range stated on the unit data plate. Either the air flow through the furnace is not sufficient or the gas input rate to the furnace exceeds the recommended rate. Verify both conditions are within the published ranges.

4. Cracked heat exchanger tube(s). If a heat exchanger tube or tubes is cracked, then the flow through the heat exchanger is restricted and the flame will either roll out of the tube inlet or heat will build to an abnormal level in the burner area. This can usually be determined by observing burner flame with and without indoor blower operation. If the flame changes when the blower is running compared to when it is not, then visually inspect the heat exchanger tubes.

If all of the above are found to be in good condition or within the operating ranges, then set the gas valve to the off position and temporarily apply control voltage (~24 volts) to pin 6 of the 9 pin ICB connector. With power applied to the unit, if the ICB LED continues to flash a code 7, then replace the ICB and return unit to operation (you must remove the temporary voltage to pin 6 before the gas valve is turned on). If the ICB LED flashes a heartbeat, then replace the rollout switch, remove the temporary voltage applied to pin 6, turn on the gas valve, restart the furnace and verify proper operation of the furnace.

UNEXPECTED FLAME PRESENCE

If a flame is present without a call for heat (flash code 8), then the ICB will continue operation of the draft motor and the UCB will call for indoor operation when either of the temperature limit opens. If the unit is correctly wired and there is not a call for heat, then check for control voltage to the gas valve. If control voltage exists at the gas valve, then replace the ICB. If voltage is not present at the gas valve, then replace the gas valve.

SYMPTOMATIC TROUBLESHOOTING

On calls for heating, the draft motor operates and the furnace lights but the supply air blower motor does not energize after a short delay (the room thermostat fan switch is in “AUTO” position).

1. Place the thermostat fan switch in the “ON” position. If the supply air blower motor energizes, go to Step 10.
2. If the supply air blower motor does not energize when the fan switch is set to “ON,” check that line voltage is being supplied to the contacts of the M2 contactor, and that the contactor is pulled in. Check for loose wiring between the contactor and the supply air blower motor.
3. If M2 is pulled in and voltage is supplied at M2, lightly touch the supply air blower motor housing. If it is hot, the motor may be off on inherent protection. Cancel any thermostat calls and set the fan switch to “AUTO”, wait for the internal overload to reset. Test again when cool.
4. If M2 is not pulled in, check for 24 volts at the M2 coil. If 24 volts is present at M2 but M2 is not pulled in, replace the contactor.
5. Failing the above, if there is line voltage supplied at M2, M2 is pulled in, and the supply air blower motor still does not operate, replace the motor.
6. If 24 volts is not present at M2, check that 24 volts is present at the supply air blower motor terminal on the UCB. If 24 volts is present at the UCB terminal, check for loose wiring between the UCB and M2.

7. If 24 volts is not present at the UCB supply air blower motor terminal, check for 24 volts from the

room thermostat. If 24 volts is not present from the room thermostat, check for the following:

a. Proper operation of the room thermostat (contact between R and G with the fan switch in the “ON” position and in the “AUTO” position during operation calls).

b. Proper wiring between the room thermostat and the UCB.

c. Loose wiring from the room thermostat to the UCB.

8. If 24 volts is present at the room thermostat but not at the UCB, check for proper wiring between the thermostat and the UCB, i.e. that the thermostat G terminal is connected to the G terminal of the UCB, and for loose wiring.

9. If the thermostat and UCB are properly wired, replace the UCB.

10. If the blower motor runs with the fan switch in the “ON” position but does not run shortly after the furnace has ignited when the fan switch is in the “AUTO” position, check the room thermostat for contact between R and G during “W1” calls.

On calls for heating, the supply air blower operates but the draft motor does not (the room thermostat fan switch is in the “AUTO” position).

1. The draft motor has inherent protection. If the motor shell is hot to the touch, wait for the internal overload to reset.

2. If the motor shell is cold with the room thermostat calling for heat, check if 24 volts is present at the room thermostat but not at the UCB, check for proper wiring between the thermostat and the UCB, i.e. that the thermostat “W1” terminal is connected to the “W1” terminal of the UCB, and for loose wiring.

3. The draft motor is a 230 volt draft motor on all models regardless of unit supply voltage. If the ICB is flashing a code other than the heartbeat, then troubleshoot the device indicated by the fault code. If not, then remove power to the unit for more than 20 seconds. If upon restoring the power to the unit the draft motor does not start with a call for heat, then verify that terminal “L1” of the ICB has a minimum of 120 volts to ground on 230 and 460 volt models or a minimum of 18 volts to ground on 575 volt models. If terminal “L1” does not have the minimum voltage, then check the wiring between the unit control box and the ICB on all models and on 460 volt models, the transformer in the gas heat compartment and its wiring. If terminal “L1” does have the minimum voltage, then check for the minimum voltage on terminal “IND” of the ICB on single stage models and terminal “IND HIGH” of the ICB on two stage models. If voltage is not present at the terminal, then verify wiring between the control box and the ICB. If all wiring is intact, then ICB is at fault. If voltage is present at the terminal on 230 and 460 volt models, then the draft motor is at fault. On 575 volt models, if voltage is present at the terminal, then check the draft motor relay DMR mounted above the ICB. First verify that the relay is pulled in by visual inspection. If not, then verify the minimum voltage is present between terminals “A” and “B” of the relay. If the minimum voltage is not present, then check the wiring. If it is present, then verify that a minimum of 150 volts is present at terminals “5” and “7” of the draft motor relay. If not present at terminal “7” of the draft motor relay, then troubleshoot the transformer in blower section and its wiring. If present at terminal “7” and not at terminal “5” of the draft motor relay, then the relay is at fault. If the minimum voltage is present at terminal 5 of the draft motor relay, then the draft motor is at fault.

The ignitor sparks at the pilot burner but the pilot does not ignite and a gas odor is detected at the draft motor outlet.

1. Adjust the pilot adjust screw on the gas valve as described in “PILOT CHECKOUT” on page 47.

2. Check the supply pressure as described in “POST START CHECK LIST” on page 46. Make adjustments as necessary.

3. Check the pilot orifice and pilot burner for obstruction as described in paragraph above. Clean as needed but the problem should not be the gas valve.

The pilot burner ignites but the ignitor continues to spark and the main burners do not ignite.

1. Make the same checks and adjustment as described in “PILOT CHECKOUT” on page 47.

2. Check the supply pressure as described in “POST START CHECK LIST” on page 46. Make adjustments as necessary.

3. Make sure that the pilot burner is not bent or damaged.

4. Make sure that the ground connections at the pilot burner, gas valve and ignition control are intact. Check the ignitor wire for good electrical connection. If all are intact, replace the ignition control.

The pilot burner lights and the spark stops but the main burners do not light.

1. Check electrical connections between the ignition control and the gas valve. If intact, check for 24 volts across terminals “MV” and “GROUND” terminals. If no voltage detected, replace ignition control. If voltage is present, replace gas valve.

Main burners light but exhibit erratic flame characteristics.

1. Adjust air shutters as described in “BURNER AIR SHUTTER ADJUSTMENT” on page 47.

2. Check the main burner orifices for obstruction and alignment. Removal procedure is described in BURNER INSTRUCTIONS on page 47. Clean or replace burner orifices and burners as needed.

UNIT FLASH CODES

Various flash codes are utilized by the unit control board (UCB) and the ignition control board (ICB) to aid in troubleshooting. Flash codes are distinguished by the short on and off cycle used (approximately 200ms on and 200ms off). To show normal operation, the control boards flashes a 1 second on, 1 second off “heartbeat” during normal operation. This is to verify that the UCB and the ICB are functioning correctly. Do not confuse this with an error flash code. To prevent confusion, a 1-flash, flash code is not used.

Current alarms or active restrictions are flashed on the UCB LED. Pressing and releasing the ALARMS button on the UCB can check the alarm history. The UCB will cycle through the last five (5) alarms, most recent to oldest, separating each alarm flash code by approximately 2 seconds.

Current alarms or active restrictions are flashed on the ICB LED. No history is stored on the ICB.

In some cases, it may be necessary to “zero” the ASCD for the compressors in order to perform troubleshooting. To reset all ASCDs for one cycle, press and release the UCB TEST button once.

TABLE 32: UNIT CONTROL BOARD FLASH CODES

Flash Code	Description
On Steady	Control Failure - Replace Control
Heart Beat	Normal Operation
1 Flash	Not Applicable
2 Flashes	Control waiting ASCD[1]
3 Flashes	HPS1 - Compressor Lock out
5 Flashes	LPS1 - Compressor Lock out
7 Flashes	FS1 - Compressor Lock out
9 Flashes	Ignition Control Locked Out/ Ignition Control Failure / Limit Switch Trip / No Jumper Plug in Heat Section
10 Flashes	Compressors Locked Out On Low Outdoor Air Temperature[1]
11 Flashes	Compressors Locked Out Because The Economizer Is Using Free Cooling[1]
13 Flashes	Compressor Held Off Due To Low Voltage[1]
14 Flashes	EEPROM Storage Failure (Control Failure)
OFF	No Power or Control Failure

1. These flash codes do not represent alarms.

TABLE 33: IGNITION CONTROL BOARD FLASH CODES

Flash Code	Description
On Steady	Control Failure - Replace Control
Heart Beat	Normal Operation
1 Flash	Not Applicable
2 Flashes	Pressure / Centrifugal Switch Open with Inducer On
3 Flashes	Pressure / Centrifugal Switch Closed with Inducer Off
4 Flashes	Not Applicable
5 Flashes	Lock Out From Too Many Flame Losses
6 Flashes	High Temperature Switch Open (Primary or Aux.)
7 Flashes	Rollout Switch Open
8 Flashes	Flame Present With Gas OFF

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